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PUBLISHED BY THE SOUTH PACIFIC COMMISSION, NOUMEA, NEW CALEDONIA

THE SOUTH PACIFIC COMMISSION

The South Pacific Commission is an advisory and consultative body set up by the six Governments responsible for the administration of Island Territories in the South Pacific region. Its purpose is to recommend to the member Governments means for promoting the well-being of the people of these territories. It is concerned with social, economic and health matters. Its headquarters are at Noumea, New Caledonia.

The Commission was established by an Agreement between the Governments of Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America, signed at Canberra on the 6th February, 1947, and finally ratified on the 29th July, 1948. Until the 7th November, 1951, the area of the Commission's activities comprised territories lying generally south of the equator from and including Netherlands New Guinea in the west to the French Establishments in Oceania and Pitcairn in the east. On 7th November, 1951, an additional Agreement was signed at Commission headquarters in Noumea on behalf of the six participating Governments, extending the scope of the Commission to include Guam and the Trust Territory of the Pacific Islands under United States administration.

The Commission consists of twelve Commissioners, two from each Government, and from 1948 until 1953 met twice a year. It now normally holds one Session each year. There are two auxiliary bodies, the Research Council and the South Pacific Conference.

The Research Council, which assembles once a year, held its first meeting in May, 1949. Members are appointed by the Commission, and are selected for their special knowledge of the questions with which the Commission is concerned, and the problems of the territories in these fields. The chief function of the Research Council is to advise the Commission what investigations are necessary. Arrangements to carry out those that are approved are the responsibility of the Secretary-General and other principal officers.

The South Pacific Conference, which meets at intervals not exceeding three years, consists of delegates from the local inhabitants of the territories, who may be accompanied by advisers. The first Conference was held in Suva in April, 1950, and was attended by delegates from fifteen territories and from the Kingdom of Tonga. The second Conference was held at Commission headquarters in April, 1953.

The Commission's staff includes six principal officers, as follows: Secretary-General, Dr. R. C. Bedell; Deputy Chairman of the Research Council, Dr. E. M. Ojala; Deputy Secretary-General, Mr. John Ryan; Executive Officer for Health, Dr. E. Massal; Executive Officer for Economic Development, Dr. A. H. J. Kroon; Executive Officer for Social Development, Mr. H. E. Maude, O.B.E. The Deputy Chairman and the three Executive Officers are ex officio members of the Research Council. The principal officers are supported by a small technical and administrative staff.

Further particulars of the Commission's activities may be obtained from the Secretary-General, Noumea, New Caledonia.

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THE SPC QUARTERLY BULLETIN, first published in January, 1951, features articles on selected activities in the Commission's three main fields of operation: economic development, health and social development. Articles are also contributed by specialists working in these and related fields, in the territories within the Commission area.

THE BULLETIN is given selective world distribution to people and institutions in widely differing fields sharing a common interest in the purposes and work of the Commission. It is published in two editions, English and French.

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One of the coconut log traps set at intervals along the boundaries of the more severely beetle-infested areas of the New Zealand Reparation Estates plantation at Vailele, where field studies are being carried out by Dr. Cumber. Teams of workers inspect the traps at regular intervals, collecting the beetles for experimental purposes and destroying any eggs or larvae.

Rhinoceros Beetle Investigations in Western Samoa

By R. A. CUMBER

Entomologist, South Pacific Commission

In the last issue of the Quarterly Bulletin *an article appeared briefly describing the work of Mr. T. V. Venkatraman, the Commission entomologist investigating rhinoceros beetle* (Oryctes rhinoceros) *biological control aspects, and searching for parasites, predators and diseases in India and South-East Asia. Dr. R. A. Cumber, the other entomologist engaged on the Commission's research project to combat this major threat to the coconut palm in the South Pacific, describes below the studies on beetle ecology and control he is carrying out in Western Samoa.*

A HEADQUARTERS was established in January, 1954, in a temporary laboratory at the Apia Hospital, kindly made available by Dr. T. C. Lonie, Director of Public Health. Equipment which had to be requisitioned from as far afield as England continued to arrive for several months, but the immediate requirements were available either locally or were brought from New Zealand, and no inconvenience was experienced. The Land Rover has proved invaluable, making it possible to continue the experimental work set up in plantations despite adverse weather conditions. The majority of these areas, mainly on account of the volcanic nature of the country, present rough going, and without a vehicle of this type only a fraction of the work could be carried out. Equal good fortune attended the selection (on the recommendation of the Director of Agriculture, Mr. H. S. Newton) of Assistant Tua'i, whose duties include those of driver, interpreter and general field and laboratory assistant.

During the year the necessary insectory designed to meet tropical conditions was constructed with aid from the Agriculture and Public Works Departments. Recently, headquarters has been shifted to the Agriculture Department laboratory which is housed in a new building very favourably situated on the waterfront, and conveniently close to the insectary.

During the settling-in period, and subsequently, ready assistance has been given by the Government of Western Samoa and the New Zealand Reparation Estates.

The Research Programme

The comprehensive research programme being carried out in Western Samoa includes "field and/or laboratory testing of possible attractants; research on the ecology and population dynamics of the beetle; research on flight habits and flight range in relation to quarantine problems; research on the efficacy of existing methods of control; research on insecticidal treatment of breeding places and of beetles; assistance with liberation and/or breeding of parasites, predators, and diseases shipped from abroad."

It has not been possible to tackle all sections of the work simultaneously. The programme has been planned in accordance with the facilities and assistance available, and what would appear to be a logical and economical sequence. In the first instance it is necessary to become familiar with the insect in its various activities. The information gained in these preliminary field studies assists in planning subsequent work.

The Log-Trapping System

The starting point of the investigations was a study of the log-trapping which has been carried out on the plantations of the New Zealand Reparation Estates under the direction of the General Manager, Mr. D. R. A. Eden, for many years, and which has proved a valuable weapon in resisting the inroads of the beetle. In addition to providing a useful introduction to the work, this trapping system has enabled the setting up of experimental work designed to provide basic ecological information. This information is in turn enabling a more efficient use of traps. The work is planned and carried out in conjunction with the routine setting up, servicing, and searching of traps on the New Zea-

* An article describing the Commission's Rhinoceros Beetle research programme appeared in the **Quarterly Bulletin**, Vol. 4, No. 2, of April, 1954.—Editor.

land Reparation Estates plantation at Vailele, managed by Mr. D. M. Heise.

The trunks of dead palms are cut into lengths of about four feet which are then split through the centres. A log trap consists usually of ten or twelve such pieces laid face downwards and side by side. These traps are set at intervals mainly along the boundaries of the more severely affected areas. The beetles, which fly for the most part between the hours of 7 and 9.30 p.m., are attracted to the logs, where they remain for a period tunnelling in the earth or softer wood. They gather here for mating and egg laying. Teams of searchers lift the logs at regular intervals with hook-ended irons and collect the beetles, at the same time destroying any eggs or larvae encountered. Such traps appear to have a useful life of about six months, after which the logs are soon reduced to shells due to the rotting of their inner portions. This trapping system is also providing the very necessary supply of beetles used in experimental work.

Fluctuating Beetle Catches

Apart from such factors as location of traps, and age of the logs comprising the traps, there is a marked fluctuation in the numbers of beetles taken from one collection day to the next. For example, the total catch from one set of 139 traps dropped from 81 to 29 beetles in successive searchings separated by three days, and on one occasion the number fell as low as three.

This fluctuation in numbers is being studied further as it indicates an important aspect of beetle behaviour. The beetles may occupy only two positions, namely, ground wood for mating and oviposition, and palm crowns for their damaging sap feeding. Their relative absence from one of these positions indicates their presence in the other.

The effect of prevailing weather conditions on movements of the beetles is being studied, and it would appear that periods of heavy rains, e.g. 3-4 inches in three days, drives the majority of the beetles from the ground wood to the crowns, and their return is dependent upon continuing fine weather. The possibility of an over-riding cyclical movement independent of prevailing weather conditions and perhaps dependent upon oviposition pressure, has not been overlooked and is being studied. The conditions under which the marked beetle flights take place are becoming understood—a necessary preliminary piece of information when planning and analysing such work as field testing of attractants and different types of light.

Likewise there are factors apart from prevailing weather conditions which govern the efficiency of traps. Records of catches from individual traps are being taken over long periods to ascertain such factors as—should traps be laid on hollows, on slopes, on flat ground or on rises?—is it better to place traps peripherally or evenly throughout areas which are badly damaged?—are a large number of small traps more efficient than a smaller number of large traps?—what are the relative efficiencies of traps composed of logs of various ages?—are the traps composed of unsplit logs as effective as those made from split logs?—what is the effect of adjacent and overhead cover on the effectiveness of traps?

Marking of Beetles

The marking of insects so that they may be recognized when recaptured is a valuable aid in gathering information on habits. Depending upon the insect concerned, such agents as paints, dyes, and even radioactive materials have been used. With a large and hardy individual such as the rhinoceros beetle, marking becomes a simple procedure. Small grooves made by means of a three-cornered file in various positions on the left and right wing cases have been used to number individuals or mark batches of beetles.

The time which beetles spend beneath traps has been determined by the daily inspection of a number of traps and the numbering and returning to the trap of any beetle found beneath it. The times spent by both males and females at this site have been determined, and the resulting information is useful in deciding how frequently traps should be searched.

Total populations of beetles have been estimated by calculations based on the percentage of marked beetles among recoveries and the original number of marked beetles liberated. The beetle populations so estimated have been correlated with degrees of damage. It has also been possible to assess the efficiency of the log traps in relation to the total population of beetles.

The liberation area for marked beetles at the Vailele plantation is a central one. Information has been gathered on such questions as directional drift of beetle populations, distances covered by individuals in known times, and the age which beetles may live to under field conditions. All beetles taken by searchers from the various log-trapped areas are examined for recovery purposes. Searchers have been fully acquainted with the purposes of such work and have co-operated willingly in such details as keeping separate the catches from the different areas.

Distribution of Damage

There is often a considerable variation in the extent of the damage in the various aspects of the one plantation. In addition, the siting of plantations in relation to topography and adjacent cover, have a bearing on the severity of beetle attack.

The study of the former problem has entailed detailed plantation mapping by means of base lines and traverses in which an index of damage is given to each palm. This mapping is followed by a close inspection of adjacent areas to ascertain the presence of breeding sites or effects of adjacent cover. Some 380 acres of plantation have been mapped in this work.

The second problem—that of regional distribution of damage—requires assessments over considerable areas. Certain patterns of damage are now becoming evident. Recently the islands have been mapped by means of aerial photographs, and these have been useful in verifying such patterns. These studies enable prediction of the fate of proposed plantations in the face of the present general severity of attack by the beetle.

Testing of Possible Attractants

It is well known that certain chemicals attract some species of insects, and in a limited number of cases such attractants have been used to trap successfully. Sixty of these chemicals are being tested here. Should one, or a mixture of several, attract the beetle, then artificial bait traps, or log traps enhanced with odours may prove useful.

The effectiveness of such attractants must in the end be proved in field trials. With some insects it is possible, by means of instruments termed olfactometers, to test attractants under laboratory or insectary conditions, success usually depending upon the suitability of the insect in question and the type of

QUARTERLY BULLETIN and PACIFIC READING To be Amalgamated in July

The two quarterly magazines issued by the South Pacific Commission, the *Quarterly Bulletin* and *Pacific Reading,* are shortly to be combined in one publication under the title of the former.

Pacific Reading is published by the South Pacific Commission Literature Bureau, established by the Commission to stimulate provision of literature and visual aids for island peoples. Each issue records information from the Pacific area about work being done there in the preparation, distribution and use of new literature and visual aids.

It is intended that the amalgamation of the two magazines will take effect from the July issue of the *Quarterly Bulletin.* Subscribers to *Pacific Reading* whose subscriptions have not been exhausted by that date will have them applied to the *Quarterly Bulletin,* without extra charge. Alternatively, the amount involved will be refunded where readers so desire.

olfactometer used. (An olfactometer compares the reactions of the insect in streams of air with or without odours.) If it is possible to obtain measurable responses under these conditions, then the work of field testing may be considerably reduced.

In the case of the rhinoceros beetle two sets of stimuli are involved. One guides the insect to the rotten wood or organic accumulation where mating and oviposition occur, and the other guides the insect to the crowns of palms for sap feeding. The reactions to these stimuli must take place during the nocturnal flights.

Several types of olfactometer have been constructed and tested during the active flight period with the substances which in nature evoke the two sets of responses, but only random movements of the beetles could be detected. A number of attractant chemicals were tested, but with the same results. It seemed apparent that responses could be anticipated only when flight had commenced. The latest tests involve the use of trays set on the floor of a ten-foot square insectary room. By varying the contents of the trays and allowing the beetles from bulk tins to take flight as it suits them, definite responses have been obtained as indicated by the numbers of beetles found in the trays next morning. Metal sides to the trays ensure that entry is only by flight. This work is in its preliminary stages, and can be more precisely undertaken now that some knowledge of the ecology of the insect has been obtained.

Several biological control agents have previously been established in Western Samoa. These include insect species and a fungus. It is difficult to assess the value of these agents, but there can be no doubt that they are assisting in the control of the pest. The sets of conditions under which any two such agents work are likely to vary, so that satisfactory control is more likely to come through the use of several parasitic species. For example, one may be better adapted to compost and accumulations of organic materials, another to standing dead wood, and another to fallen dead wood. The incidence of the established parasites is being studied.

In anticipation of the arrival of parasitic materials from overseas, it is necessary to be able to rear rhinoceros beetles under laboratory or insectary conditions, where they may be studied in association with the parasites. Techniques have been devised for the rearing of the various stages.

Two new possible biological control agents have been tested. These are species of bacteria received from Dr. R. L. Beard of the Connecticut Agriculture Experiment Station, who collected them during his study of the diseases of beetles allied to the rhinoceros beetle in Australia. In nature these bacteria are ingested with the food and subsequently the larvae turn a milky colour due to the multiplication of the bacteria followed by spore formation. When the larvae disintegrate, the spores are liberated in the soil. Laboratory tests have been made in which larvae have been ingested with and fed spore suspensions. Further tests are to be carried out.

Against the above background of some of the work being carried out in Western Samoa, it will be realized that duties from day to day and month to month contain some variety.

In the laboratory, work carried out includes measuring the size of beetles to determine any seasonal variations in size; dissecting of beetles of known ages to determine the changes in the internal organs which in turn manifest themselves as changes in the habits or behaviour of the beetle; recording and analysing of field data, and planning of the various stages of the work. In the insectary larvae are raised and beetles are kept alive for various purposes; the progress of grubs being tested with diseases, etc., is watched, and tests with attractants are set up.

In the field one may be occupied in recording the numbers, sexes, etc., of beetles taken from sets of traps; with the searching for breeding sites in the vicinity of villages, bush clearings, or plantations; with the mapping of damage in plantation areas; with the recovery of beetles from the crowns of palms (incidentally, with the assistance of climbers); with the collection of larvae and other materials for the laboratory and insectary tests.

The work on insecticides will be carried out when the work on attractants is completed.

Basic Studies Essential

The old maxim of "know your enemy intimately" holds well in tackling a problem such as that with which we are faced here. Basic ecological studies are the ones which give us a real insight into the habits of the pest, and such studies have been neglected in the past mainly because they take a long time.

A high priority is given to the work invloving biological control agents as this is the most promising avenue of research. Other control measures, although theoretically possible, vary in their practicability according to the outlook and developmental state of the local peoples.

Grassland Survey Team

THE South Pacific Commission, with the co-operation of the Commonwealth Scientific and Industrial Research Organisation and the Food and Agriculture Organisation of the United Nations, initiated a survey extending from 9th January to 12th March last to examine the factors responsible for the very low and inadequate beef production in the South Pacific region, and to make recommendations for a grassland research programme with the objective of making substantial improvements in production based on plant and animal performance.

Dr. A. H. J. Kroon (S.P.C.), Dr. E. Phillis and Mr. W. W. Bryan (C.S.I.R.O.), and Mr. A. T. Semple (F.A.O.), constituted the team.

Beginning in Netherlands New Guinea the team visited a few points on both the north and south coasts; in Australian New Guinea, the Highlands, the Sepik and Markham-Ramu valleys on the north coast, the environs of Port Moresby, and Orangerie Bay on the south coast, were visited; in New Britain, the Gazelle Peninsula; Viti Levu in the Fiji Islands; and the west coast of New Caledonia.

The team's report is now being considered by the Commission.

The grassland team examining a sown pasture of Centrosema pubescens and Guinea grass on M. Fayard's farm in New Caledonia. Left to right: Mr. Bryan, Dr. Phillis, M. Fayard, Dr. Kroon and Mr. Semple.

Rat Control Scheme For Tahiti Planters

A simple, low-cost system developed to protect coconut growers in Tahiti from heavy losses due to rat damage is described below.

By R. LASSALLE-SERE*

Coconut palms banded for protection against rats in a plantation in French Oceania. Banding costs are more than recovered in the first year, due to increased production.

IN those blest islands of the South Pacific, where for the sake of man nature seems to have put on its finest array, and both land and sea unite to make his life easier, the rat is the worm in the fruit. It attacks the crops and claims the greater part of them. It can carry diseases such as plague, scrub typhus, and leptospirosis, which are communicable to man. Further, it contributes largely to the development of the mosquito, the carrier of filariasis, by preparing breeding places for its larvae. Lowered production and decreased working capacity of a population, weakened and thinned out by diseases: such are the evils for which the rat is responsible.

In the main portion of the South Pacific Commission's area, where the coconut grows and forms the chief source of income of the islanders, the rat is a real pest. The following lines, extracted from a survey by the Commission's Plant and Animal Quarantine Officer, Mr. L. J. Dumbleton, will bring some light to bear on the damage wrought by the rat.

Simmonds (1938) states that rats probably cause the coconut growers of the Eastern Pacific heavier losses than any other single agency. Turbet (1925) estimated that 10% of the crops was lost through rat damage in Fiji. Taylor (1930) estimated the nutfall due to rats in Fiji as 6.8%. and Paine (1935) estimated the loss as 28% on Taveuni (Fiji). Thévenot (1952) states that 10% of the coconuts produced on Wallis Island are destroyed by rats and flying foxes together. A paper given by the Tongan delegate to the Second South Pacific Conference estimates that the losses of copra are 30% to 50%.

The most convincing evidence of the extent of copra losses due to rat damage is that provided by Edgar and Bambridge (1951) working in Tahiti.

Sixteen plots, each containing at least fifty trees, were selected in eight districts. Twelve of these plots were without metal bands on the trees. On four plots the trees were provided with metal bands. All fallen nuts were cleared from the plots. Every eight days thereafter, from May 1950 to April 1951, the fallen nuts were recorded as damaged or undamaged and cleared off the plots.

	Number of plots	Number of trees	Total nuts produced in period	Average nuts per tree	Number of nuts damaged	% of nuts damaged
Banded	4	222	5,666	25	19	0.33
Unbanded	12	997	34,120	34	9,556	28.0

Of the unbanded plots one had only 10.7% of the nuts damaged but this was in a district where a rat control programme had been operating for several years. The percentage of damaged nuts on the other unbanded plots varied between 27% and 47%.

It is not, therefore, exaggerated to claim that the figures for copra exports in Polynesia could be increased and, in some instances, even doubled if it were possible to prevent rats from attacking the nuts. The experiments which have been made in Tahiti under due control have proved that metal bands[1] placed round the trunks of coconut palms provide adequate protection. On those plantations where the palms have been ringed in this way, the percentage of damaged nuts has dropped to a negligible figure.

Nor is this a recent device. Old worn-out tree-bands seemingly out of use are to be found lying here and there in all the coconut-growing islands. If the islanders are asked the reasons for this surprising discontinuance, some reply that the bands corrode too quickly under the action of the sea air and it is too expensive to replace them. Others argue that the rats still continue to move from one plantation to another along the upper branches. But in fact the main causes are sluggishness and laziness. The immediate rise in production very adequately makes up for the expense of renewing the bands which, in any case, can be made from sheet aluminium which does not corrode so quickly. Moreover, it is not difficult to isolate a plantation with rat-bands on all the trees, if the upper palms and branches all along its boundaries are cut off.

The bands, it is argued, would be harmful to the actual trees, but any damage due to rot or insect attack under the bands is in fact very slight.

Thus there remains only the financial problem, always a difficult one where islanders are concerned, since it is hard for them to amass sufficient capital; on the other hand, they are allowed credit only on draconian conditions which are often ruinous. In view of these facts the following system has been set up in Tahiti. Those coconut owners who want to have their trees banded are granted

* Monsieur Lassalle-Sere is Senior Commissioner for France on the South Pacific Commission.

1 The bands used are of sheet aluminium (and sometimes of zinc) which is sold by commercial firms in rolls approximately 16 inches in width and cut to the required length. They are affixed to the palm at a height of about 12 feet above the ground by means of three aluminium nails. The first bands applied are now about 6 years old and are still in good condition. It is expected that they will have a life of about 10 or 12 years.

a theoretical loan by an official credit organisation, the Central Fund of Agricultural Mutual Aid. In practice, the loan is actually spent by this organization, which pays directly for the expenses of banding. Banding is done by specialized teams so as to be completed as quickly as possible and under the best possible conditions. The teams are followed by two or three inspectors who must be satisfied that the work has been done properly.

The period of time required to complete this operation depends, of course, on the number of trees and the size of the teams. In Tahiti, the total number of unbanded trees in the whole region of the high islands has been estimated at 1,600,000. The region has been divided into 36 areas carrying about 44,400 coconut palms each. Banding, in each area, will require a month's work, so that in the whole region, the operation may be completed in three years' time. With three times as many teams, that is, with a working capital three times as great at the outset, the work could be done in a year. Conversely, if the working capital were smaller the operation might extend over four or five years or more. The composition of such a team and its estimated working capacity are not known for the time being.

On the other hand, the average production of an unbanded coconut palm has been estimated at 7 or 8 kilos,[2] and that of a banded tree at 10 or 11 kilos. The average market price is 10 francs (CFP) a kilo, so that the rise in production will bring in a further income of 30 francs or so a year from the first year. The cost of banding one tree with an aluminium band has been estimated at 25 francs; 22 francs for the band and 3 francs for fitting it.

Thus the banding cost is recovered in the first year, and there is a further profit of 5 francs per tree. It would, therefore, be advantageous to band the trees within the shortest possible period. The length of the operation should not depend on the number of teams available as it should prove an easy matter to increase them, the actual work being simple; it is merely a question of the funds available.

As regards the repayment of the loans granted by the credit organization, several methods might be applied. The best is that requiring the minimum interference from the administration, the fund and the persons concerned, since this always means added expense, difficulties, and delays in the completion of the financial operation. The easiest method is to impose an export duty on copra. The rate of this duty may vary depending on whether the sum total of the loan is to be paid back within three, four, five years or more. It would, of course, be easier to wait until the operation is completed before imposing this duty, and to ensure fairness it might be provided that the duty be refunded to those owners whose trees were already banded or have themselves paid for bands and fitting.

In those countries where an export duty on copra already exists, revenue thus obtained should be used for paying off the loans granted. Indeed, export duty on agricultural produce is most unfair as only a section of growers is taxed and it is moreover the very section which deserves to receive more attention than the rest, as it provides the country with a means of foreign exchange. The levying of such duties is economically unsound as they tend to paralyse marginal production, through the impossibility of exporting such produce when prevailing prices are too low or when the site of production is too remote. In ordinary circumstances it would be better to abolish them and instead maintain the revenue, by levying import duties or consumer's duties at an appropriate rate. It is only where the revenue from the export duties assists in developing the production on which they are levied, as in the case envisaged above, that they can be justified.

In these circumstances, and since reimbursement of loans is guaranteed, it should be possible to find banks who would agree to lend the necessary working capital (failing the existence of a credit fund established by the administration). In that case, the rate of interest would probably be higher. But this could affect only the duration of repayment, and just slightly in any case.

Poisoning Also Necessary

The rat problem of course will not be solved by the implementation of this system. It will still be necessary to destroy rodents by poisoning in those places outside the coconut groves where they will continue to find food.*

Are not the assurance of increased production, however, as well as the disappearance of the quantities of hollow shells left by the rats to provide breeding places for mosquito larvae, sufficient justification for a system which is not only basically simple but which requires little labour and relatively small means?

2 One kilogram equals 2.2 pounds.

* An article "Rat Poisoning In French Oceania" appears on page 15 of this issue.—EDITOR.

Australian School Of Pacific Administration .... Recent Review Of Policy

An article on the Australian School of Pacific Administration was published in the QUARTERLY BULLETIN *for January, 1954. Recent changes in policy affecting the School, which has been the educational training centre for officers of the Papua and New Guinea Administration, were announced in December by Mr. Paul Hasluck, Minister for Territories, and are summarized below.*

POLICY affecting the Australian School of Pacific Administration has recently been reviewed by Commonwealth authorities. The future role of the growth and organization of the Public Services of Papua and New Guinea and other Australian territories, and in the light of other educational and training requirements.

It has been decided that the School is to continue as a separate institution with its own principal and staff, and that it should when practicable be transferred from Sydney to Canberra.

In the past the School has been concerned almost exclusively with the Papua and New Guinea Services. Within this sphere it has provided introductory courses for cadet patrol officers and on occasions for medical and agricultural officers; special courses for education officers; and advanced two-year diploma courses for officers of the Department of District Services and Native Affairs.

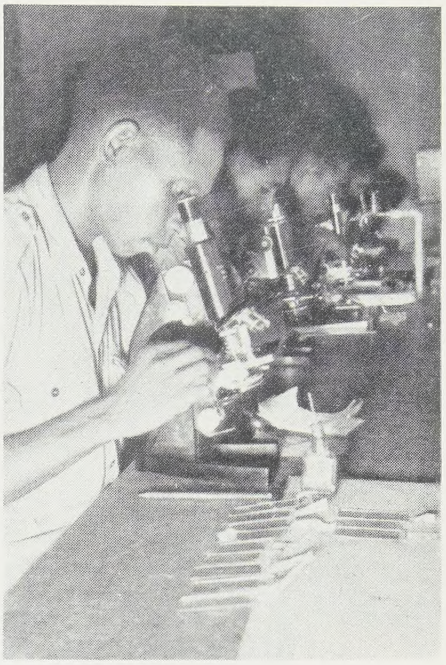
It is now planned to make the facilities of the School more widely available to all branches of the Public Service in Papua and New Guinea, and to extend its scope where appropriate to the Public Services of the other Australian territories including Nauru and the Northern Territory.

The courses given at the School will accordingly be reorganized into an orientation course of between three and six weeks for officers joining a territorial service; a long course of one year, for selected officers from all services, in place of the previous two-year diploma course; and special courses of approximately six weeks duration for higher administration officers, to cover a single subject or several subjects, and to be planned from year to year to meet territorial needs.

The reorganized programme of the School will be co-ordinated with special training courses that are to be made available through the Commonwealth Public Services, and with in-service training to be provided in the territories themselves. These various branches of training have been planned in relation to the very considerable expansion of the territorial Public Services which has been achieved since the immediate post-war years: in Papua and New Guinea alone, the Public Service has been quadrupled in numbers in less than ten years, the present staff numbering 1,746.

Left: Native boys of the Sentani Lake area undergoing instruction in residual spraying with DDT wettable powder suspension.

Right: Students in the course for malaria 'mantri' at the laboratory of the Malaria Control Service, Hollandia, examining blood slides for malaria parasites.



Rural Malaria Control In The S.W. Pacific

In this article, the problems of rural malaria control in the South-West Pacific are examined in the light of findings of the Second Asian Malaria Conference of the World Health Organization, held in the Philippines last November.

By ROBERT H. BLACK*

MALARIA is a very important disease in the South-West Pacific area (New Guinea, British Solomon Islands and New Hebrides). It not only causes much human illness and death but also seriously interferes with the development of these areas.

Other countries in the Western Pacific and South-East Asian regions have been faced with a similar malarial problem and, in post-war years, national malaria control campaigns have been inaugurated in many of them with malaria eradication as their aim. At the Second Asian Malaria Conference convened by the World Health Organization, reports received from 23 countries and territories disclosed that the aggregate population of these regions was 659 millions. Of these, 276 millions live in malarious areas, and in 1953, 80 millions (29%) were protected against malaria. In the South-West Pacific area only 2% of those at risk appear to have been protected.

The method of malaria control, which in the majority of countries promises eradication of the disease, is the periodical "residual spraying" of the walls of houses with the insecticide DDT[1]. Naturally, this is a large project, and to make it effective national malaria campaigns have been organized with national malaria services conducting them. The *per capita* cost of the population protected has varied usually between about 10 and 20 U.S. cents per annum during the active phase of the campaign—in a few countries the cost was more and in others less. In countries where the population in malarious regions is counted in millions the annual budget for a malaria control programme is large and financial aid has been provided by such organizations as WHO, UNICEF and FAO.

The results of these campaigns are exemplified by the report from Ceylon, where the campaign was inaugurated in 1946. In this country, where three million people lived in malarious areas, malaria has now almost been eradicated, and it has been possible to interrupt spraying in some areas.

A note of warning was sounded at the Conference when evidence was presented of the development of resistance by anopheline vectors of malaria to DDT. This was reported from areas where this insecticide had previously been used to control the aquatic larval stage of the mosquito. As a result of this report, and reports from elsewhere, the Conference recommended that in the absence of an emergency, chlorinated hydrocarbon insecticides (such as DDT) be not used either concurrently or consecutively against both adult and larval anopheline mosquitoes, and that the spraying of residual insecticides should be interrupted as soon as feasible.

Difficulties of Control in S.W. Pacific

In the South-West Pacific area there has been a delay in the implementation of nation-wide malaria control campaigns —using DDT for residual insecticide spraying. It was stated in the Annual Report of the World Health Organization for 1953 that this delay was due to some difficulties with the technical method of control. It is of interest briefly to examine these difficulties.

In Papua and New Guinea it was the impression of Australian entomologists, as the result of wartime experience, that DDT as a residual spray would not be effective against the particular anopheline vectors of malaria in the area. This impression arose from the fact that a search of houses in the daytime often resulted in the finding of no anophelines resting on the walls. It must be pointed out that the mosquito has to rest on sprayed walls for a period of time to come into contact with the DDT. However, there were reports both before and during the war of the finding of these anophelines resting in houses in the daytime and, in addition, there were many reports of mosquitoes resting indoors after feeding and prior to their leaving the house.

In Netherlands New Guinea, DDT as a residual spray has been used in 1954

(Continued on page 16)

* Dr. R. H. Black, M.D., B.S., D.T.M. & H., is malariologist at the School of Public Health and Tropical Medicine, Sydney. He acted as observer for the South Pacific Commission at the Second Asia Malaria Conference while attending as representative of the Australian Government. His article is published with the permission of the Director-General of Health of the Commonwealth of Australia.

1 By "residual spraying" is meant the application of certain insecticides to the walls of houses in such a manner as to leave a thin layer of solid particles of the insecticide on the wall surface. Contact with surfaces treated in this manner with the insecticide is lethal to mosquitoes which rest on them. The treated surfaces retain their toxicity to mosquitoes for a prolonged period—one or two months or longer.

A view of the central and northern sections of the alluvial flats, with the Sigatoka River in the middle background.

Sigatoka Agricultural Station (I)

By W. J. A. PAYNE

Officer in Charge, Sigatoka Agricultural Station, Department of Agriculture, Fiji

THE station was first established in 1927 as a cotton experimental station. Since then it has had a varied and chequered history. When cotton growing declined in importance, it became the central experimental and teaching centre, development along these lines beginning in 1938 and ending in 1942 when wartime conditions forced the abandonment of all plans.

During the period 1942-45 the station was used principally for the production of fruit and vegetables for the army. In the postwar reorganization it was decided to retain the station as a sub-station of a new dry zone station to be acquired close to Lautoka, but these plans did not materialize, and in 1947 the final decisions were made that Sigatoka should become the dry-zone station and the centre of animal husbandry experimental work in the Colony.

It is situated some four miles from the township of Sigatoka in the province of Nadroga, Viti Levu, on the lower reaches of the Sigatoka River, the second largest river in the Colony. The area available for farming operations is approximately 550 acres, composed of 90 acres of flat or gently-sloping land and 460 acres of rolling or steep hill country. It is bounded on the east by the Sigatoka River, the alluvial flats consisting of a narrow strip of land, 100 yards wide at the narrowest point and 400 yards wide at the widest, with the hills rising steeply from the flat on the south and west. The alluvial flats are lowest immediately beneath the hills and highest above the river that normally flows some 25 feet below the highest point. The flats have been flooded in the past under extreme flood conditions, but are normally free of floods.

Soils

The soils of the station are typical of large areas of Viti Levu. The alluvial soils are similar to some 16,000 acres in the Sigatoka Valley and to other alluvial soils in other river valleys. There are two types of hill soil both typical of large areas of hill country in the dry zone of Viti Levu.

The alluvial soils are derived from andesite and basalt, and four types have been distinguished, Matavelo Clay, Matavelo Clay loam, Sigatoka Clay loam, and Sigatoka sandy loam. They are all deep, fertile soils, the Matavelo Clay and Matavelo Clay loams being closer to the hills, and consequently wetter and a little more difficult to farm, than the Sigatoka clay loam and the Sigatoka sandy loam. The hill soils are shallow, being 6 to 18 inches deep and generally overlying rock. They are of two types, Kabesi clay, a grey soil, and Tuva clay, a red soil, but both have been formed from andesite tuff with some basaltic inclusions.

They both have a good crumb structure, but the Kabesi clay seems to be inherently more fertile than the Tuva clay, having a higher base status. They are both deficient in phosphate and will probably respond to phosphatic fertilisers. Samples taken from the hill soils have not revealed any major trace element deficiencies.

Climate

The climate is what might be termed marine tropical. The normal rainfall is 70-80 inches per year, approximately one-quarter falling between June and November and three-quarters between December and May. There is, therefore, a prolonged dry season, and although some rain usually falls each month, semi-drought conditions are not infrequent.

Rolling hill country on the station.

The range of temperature is from 50-100°F, the mean annual temperature being 76°F.

Development

Most of the alluvial areas were cleared in 1927. At that time the alluvial soils were covered with a dense canopy of guava (*Psidium guajava*), but this was secondary growth. The hill lands have not yet been cleared, as enclosure only started two years ago and is not yet completed. They have, however, for many years been subjected to unrestricted burning and intermittent grazing by stray cattle. The natural vegetational climax consists of a large reed known as gasau (*Miscanthus japonicus*) interspersed with a few other species, the most important being a climbing legume known as 'Wa yaka' (*Pueraria hirsuta*). This has been replaced by an unstable mixed population of grasses, legumes, and weeds. The most important of the grasses are 'gi' (*Imperata cylindrica*), native blue grass (*Amphilophis glabra*), seed grass (*Chrysopogon aciculatus*), citronella grass (*Cymbopogon nardus*), Natal red top (*Tricholaena rosen*), and wire grass (*Sporobolus diander*). Important legumes are *Desmodium heterophyllum, Alysicarpus vaginalis,* and *Atylosia scarabeoides,* and common weeds are guava, tobacco weed (*Elephantopus mollis*), blue rat tail (*Stachytarpheta urticaefolia*) and bracken fern (*Gleichenia linearis*).

Apart from laying out a field system on part of the alluvial soils, little was done to develop the station in 1927. In 1938 a new stage of development began. Quarters for two resident officers were built together with dormitories for students, an office, and a number of farm buildings such as a barn, a garage, a workshop, a small dairy, and tobacco curing sheds. Some years later a pumped water supply was installed.

Funds for post-war development were provided by the Fiji Government, by the Government of the United Kingdom from Colonial Development and Welfare funds, and by the South Pacific Commission for specific experiments. Redevelopment as an animal investigational station began in 1950 and will be almost completed by the end of 1954.

The aim has been to provide good but not lavish farm facilities for routine farming operations, as good investigational facilities as could be provided with the funds available, and decent quarters for staff and labour, together with reasonable services such as electricity and a piped water supply.

The field layout on the alluvial flats has been altered to suit mechanized farming, and all field operations have been mechanized with the exception of harvesting operations. A good farm workshop has been provided with all the normal repair and maintenance facilities. All existing buildings have been redesigned in order to improve handling facilities and to reduce labour costs, and new buildings incorporate modern ideas. Bulk handling facilities have been installed for fuels and feeding stuffs, and machinery is being installed for the drying, milling, and storage of a wide range of crops.

The dairy and the piggery and all stock handling facilities are of modern design. Milking machinery is installed in the dairy, and refrigeration will be added in the future. All buildings are provided with power. A new gravity feed water supply system has replaced the old pumping system and is capable of providing for the expansion of water consumption for many years ahead.

Experimental facilities include a small milk-testing laboratory in the dairy, and a small but adequately-equipped laboratory for physiological and biochemical work. There are weighing facilities for all classes of stock, a well-designed animal recording system, two experimental sheds designed for the experimental handling and individual feeding of dairy stock, a set of sixteen individual pens designed for the experimental feeding of pigs, a pilot drying plant for the experimental drying of crops, a meteorological station utilising modern weather recording equipment and a nursery equipped for carrying out simple pasture and fodder trials.

The road system of the station has been greatly extended and simple earth roads have been built to service all the rough hill grazings. These roads if built along the ridges are cheap to construct and maintain, and radically reduce the cost of transport for hill fencing.

No area of the station was adequately fenced in 1950 and the rough hill grazings were practically unfenced. All fencing on the alluvial flats or on the hills is now constructed of concrete posts and galvanised wire, or 'live' posts and galvanised wire. Suitable 'live' posts are grown from the following species, gliricidia (*Gliricidia sepia*), drala (*Erythrina indica*), vau (*Hibiscus tiliaceus*), and banidakai (*Jatropha curcus*). Although 'live' posts are cheaper they have many disadvantages, particularly on the hills, and major fencing works are in concrete and wire. The concrete posts are all manufactured on the station by relatively unskilled labour. The station fencing has to be particularly good as there are herds of goats and Zebu cattle, both difficult animals to fence against.

Farming System

An alternate husbandry system is being developed on the alluvial soils with the exception of two areas, one of which is continuously cropped and the other laid down to permanent pasture. On the alternate husbandry section half will be cropped and half laid down to pasture at any one time. The station dairy herd is rotated around the pastures on the alluvial flats.

Permanent pastures are being developed on the hill soils except for certain areas that will be afforested. These pastures are being used for the rearing of goats and beef cattle.

Above: A guinea-centro pasture on the alluvial flats. Right: Close-up of guinea-centro pasture.

Arable Crops

The alternate husbandry rotation is a six-year rotation, the land being three years in pasture and three in arable. During the three years arable the rotation is 'roots' (tapioca, kumala, potatoes, yam, or certain market garden crops), 'cereals' (maize, sorghum, or rice), pulses (pigeon pea, peanuts, urd, mungh, cowpea, and various other types of bean and pea), and finally 'cereals' again.

The choice of crop depends upon the season and on farm policy, and it is usually possible to take more than four crops in three years so that the rotation has to be very 'elastic'. For example, if a field is ploughed out of grass in May of one year, then it might be cropped with potatoes (3 months), followed by tapioca (9 months), followed in May of the second year by maize and in November of the same year by dry land rice, followed in May or June of the third year by a pulse and finally by rice again. This rotation produces fodder and concentrates for dairy stock, roots, straw and concentrates for pigs, and animal products, rots, grains, pulses and other vegetable crops for human consumption. The continuously-cropped area is also cropped according to the same rotation as the arable 'break' of the alternate husbandry area.

Pasture and Fodder Crops

Experiments carried out during the period 1949-52 have shown that elephant grass (*Pennisetum purpurem*) is the most suitable fodder grass on the alluvial soils. This fodder grass is now being grown on a field scale, with or without legumes. Vaivai (*Leucaena glauca*) is also being grown as a drilled crop on the alluvial soils. It is slow to establish but very persistent under grazing when once established. The fodder tree (*Sesbania grandiflora*) was introduced in 1953 and this is being planted out in the field as it is very palatable, and its leaves and young stems have a high nutritive value.

As alternate husbandry pastures are sown or old pastures ploughed and resown, different grass and legume mixtures are being tried out under field grazing conditions. The most suitable mixture tried so far has been guinea-centro (*Panicum maximum - Centrosema pubescens*). There are also pastures containing pure stands of para grass (*Brachiaria mutica*) and Nadi blue grass (*Dichanthium cariocosum*). Para grass is very productive in the wet season, as is Nadi blue grass, but both are very unproductive in the dry season. Nadi blue grass is useful because it suppresses weed growth even when heavily stocked. Creeping indigo (*Indigofera endacaphylla*) was introduced from Hawaii in 1950. It is a good pasture legume under Sigatoka conditions and probably the best area of pasture on the station is a creeping indigo-guinea grass association. Unfortunately, however, overseas workers have discovered that certain strains may be toxic to livestock.

Tree Crops

Tree crops are of some importance, both on the flat alluvial soils and on the hills. They can be used for a dual purpose on a livestock farm: to provide fruit, nuts, economic timber, and firewood, and to act as shade and shelter for the stock.

There are small areas of tall, hybrid, and dwarf coconuts on the alluvial soils under which the dairy stock are grazed, and hybrid and dwarf nuts are being extensively planted around field boundaries and the farm buildings. There are small acreages of bananas and pawpaws, and it is planned to plant three acres of cocoa on the alluvial soils.

Mixed fruit plantations are being developed on the lower slopes of the hills. These include the following species: cashew nut (*Anacardium occidentale*), Queensland nut (*Macadamia ternifolia*), breadfruit (*Artocarpus indica*), avacado pear (*Persea gratissima*), custard apple (*Anona squamosa*), bullock's heart (*Anona reticulata*), soursop (*Anona muricata*), Brazilian cherry (*Eugenia michelii*), rose apple (*Eugenia jambos*), loquat (*Eriobotrya japonica*), tamarind (*Tamarindus indica*), bell apple (*Passiflora laurifolia*), passion fruit (*Passiflora edulis*), and many types of citrus including Rotuman orange, Seville orange, mandarin, lime, and kumquat.

On the higher hills it is planned to plant shelter belts and 'spinneys' that will provide shade for the stock. Two species that grow well on the hill are yemene (*Gmelina arborea*) and large leafed mahogany (*Swietenia macrophylla*) and some plantings of these species have already been made.

Nursery

The nursery fulfils two major functions.

Plants are propagated for planting out on the station, particularly fruit, nut, and timber trees, and collections of varieties of plants propagated by vegetative methods, such as yams (*Dioscorea*

(Continued on page 23)

Water Supply In French Oceania

Today French Oceania possesses 75 district water supply systems with a total of 200 miles of mains supplying free water to 22,000 inhabitants. How the Administration has achieved this commendable objective is described in the article below . . .

By R. BERNAST*

Water in the village. In front of "her" tap which she has entwined with foliage and flowers, this Tahitian mother does not disguise her satisfaction. Previously she used to drink the water from the river channel—when it rained.

WATER is an integral part of the natural Tahitian scene—the entrancing scene which has been imagined, described or shown by literature, press and cinema; it is a vision of sparkling waterfalls, delightful rapids, and crystal-clear waters, where lightly-clad and flower-bedecked nymphs disport themselves in graceful innocence.

It is true that the Tahitian loves water, especially river water. In former times, the great majority of the population lived in valleys sometimes very far upstream. The river provided domestic and recreational facilities; it was, even for the very small children, the scene of the daily frolic.

Times have changed. The European settlements on the coast attracted populations from the valleys. Houses sprang up, dotted along the coastline, instead of forming into sizeable agglomerations The new position of the dwelling, far from natural streams, has not, however, robbed the Tahitian of his love for running water. For long past, applications have been made to the public authorities for the setting-up of a water distribution system. It is a fact worthy of notice that over more than fifty years past, and despite budgetary restrictions, the territory has allotted no small portion of its resources to satisfying the need for water, thus meeting the strong and insistent demands of public opinion and its representatives.

In 1947, in evolving details of a plan for economic and social investment and development in overseas territories (the FIDES plan) these considerations were not overlooked. An account of the motives involved confirmed that—"The installation of water supply units was regarded by the Pacific Islanders as being the finest possible token of France's affection and concern."

Equipping the territory thus took place over two successive periods, that effected within the normal local budget and, more recently, the portion carried out with the encouragement and assistance of FIDES.

Apart from the water supply system of the town of Papeete, which is a purely municipal achievement, the whole of the territory possessed prior to 1948, 31 distribution systems of varying size, representing approximately 90 miles of mains. The island of Tahiti had the best supply, but various town centres on the other islands, Uturoa (Raiatea I.), Atuona and Taiohae (Marquesas Group), for instance, were already served, some of these since the beginning of the century. However, most of the systems had become quite inadequate in the face of the increase in population; nine of them had to be completely reorganized.

An assessment of the water power of the territory, prepared in less than 18 months, brought together the basic data required for devising a water supply programme under the FIDES plan. In 100 different areas a survey of resources and observation of flow and land surveys gave some intimation of the scope of the problem and made it possible to estimate roughly the extent of funds to be allowed.

The draft plan provided for 100 separate systems, representing a total of 300 miles of mains. The cost was estimated at approximately £stg.700,000 on the basis of 1949 estimates. This equipment was only intended for the "high islands"; a special programme was devised for the "low islands" formed by the atolls of the Tuamotu group where there is no surface water.

The general plan provided for eight regional groups: 1. Tahiti; 2. Moorea; 3. Raiatea; 4. Tahaa, Borabora and Maupiti; 5; Huahine; 6. the Marquesas Archipelago (Nuku-Hiva, Va-Huka, Hiva-Oa, Tahuata and Fatu-Hiva); 7. the Austral Group (Tubuai, Rurutu, Raivavae, Rimatara and Rapa); 8. the Tuamotu Group.

In each group the problem varied according to geographical situation (distance from main town); the density, distribution and degree of sophistication of the population; health status; economic conditions and possibilities of improvement; extent and type of water resources, etc. An exact knowledge of these many aspects and an appreciation of their respective value enabled a plan to be worked out covering 1,500,000 square miles and extending over four years.

Large orders for equipment were placed both locally and in France; stag-

* Monsieur A. Bernast is head of the Industrial Techniques Division in the Public Works Department, French Oceania.

gered delivery ensured regular supply in keeping with facilities available for freight, storage, transport to the place of installation and construction. The first part of the programme which was particularly delicate to handle was devised with great attention to detail, and was completed without difficulty.

The type of material chosen was dictated by various requirements. As a general rule galvanised steel was kept for small pipe-lines placed over difficult areas, mainly airlift lines. Asbestos cement, because of its good handling qualities, gave best service in remote islands. Cast iron was the material used on large systems in districts easily accessible by transport.

In practice the following basic rules were established and strictly adhered to, despite their severity:

(1) Water shall, as a general rule, be supplied free.

(2) The daily allowance shall be 75 gallons per day and per person.

(3) Installations shall be working to full capacity within two generations.

(4) In all rural areas water shall be *supplied* and not merely "made available".

To provide free water supply, a system had to be devised "which would work by itself" without continuous supervision and a great deal of maintenance. It had, therefore, to be gravity controlled, without pumping plants, and using only waters conforming to mineralogical standards and bacterially pure, any mechanical or chemical treatment being out of the question.

The classical spring, gushing forth from the rock, was obviously the ideal solution. Springs of this type are rare in the territory, particularly those with a suitable outflow. Some remarkable ones nevertheless exist; catchment of these was simple on Tahiti and Moorea and even more so in the Marquesas.

But more than two-thirds of the water impounded is river water, some of the rivers often being no more than trickles of water. Difficulties encountered were of two types: to catch water sufficiently upstream, that is to say, outside the area of pollution, and to eliminate turbidity caused by the rain.

It was comparatively easy to solve the first. Tahitian valleys are little frequented as long as they offer no possibilities of exploitation. At a distance of about 2,000 yards from the coast, they generally become impenetrable for man or beast; it is possible to catch waters in these areas which analysis shows to be remarkably well suited for human consumption, although having a tendency to acidity (average pH slightly higher than 7). In certain cases the catchment area is placed so far upstream as to be on the border line of inaccessible areas, and sometimes at very high altitudes or in rugged and impenetrable country.

While water impounded in such conditions remains perfectly pure, it is not always crystal clear, since mountain torrents become swollen with rain sometimes as much as 1,000 times their original size. Sedimentation by modern methods, flocculation, for instance, which would require expensive materials or a full-time trained staff, is quite out of the question. This is the second difficulty.

Settling by static sedimentation was, therefore, the only solution. The water, led from a catchment area generally placed alongside the river, rushes at full force into a small structure containing several compartments, which breaks the surge and without pressure directs the water, already partially settled, into the sedimentation basin proper, situated immediately downstream.

CORRESPONDENCE INVITED

The "SPC Quarterly Bulletin" is a magazine to serve the interests and needs of Pacific Islands people. Readers are cordially invited to contribute letters on topics of general interest to its columns. Photographs will also be welcomed (prints and/or negatives will be promptly returned after use).

Correspondence should be addressed to:

The Editor,

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These devices are based on experiments carried out on transformable prototypes. They are particularly suited to the type of water collected in the territory. Subject to constant minor improvements, these model devices ensure fairly adequate removal of turbidity from swiftly running water; consumers have always expressed complete satisfaction at the quality of the water supplied. It might be added that "free of charge one can hardly do better."

These structures are almost always of large dimensions and, for this reason, are expensive to build. But they have the great advantage of working without continuous supervision; regulation of inflow only needs checking from time to time so that it may correspond as nearly as possible to supply demand. The structures can be of various types and are thus adaptable to the requirements of the site, which often presents problems in narrow valleys. They can be placed over a storage basin or arranged to act as deflectors. The following minimum standards should be respected (at any rate in this territory):

(a) Sedimentation area: 27 square feet per pint—second of effluent.

(b) Ascensional speed of the watercourse subjected to sedimentation: 28 inches per hour.

(c) Period for which one molecule of water is subjected to sedimentation: 2 hours.

When the site allows for it, systems of some importance are provided with "pre-settling reservoirs". Their purpose is to divide off the definitely heavy particles. In these devices, which are always very elongated, an attempt is made to reduce the speed of longitudinal advance of the watercourse as far as possible.

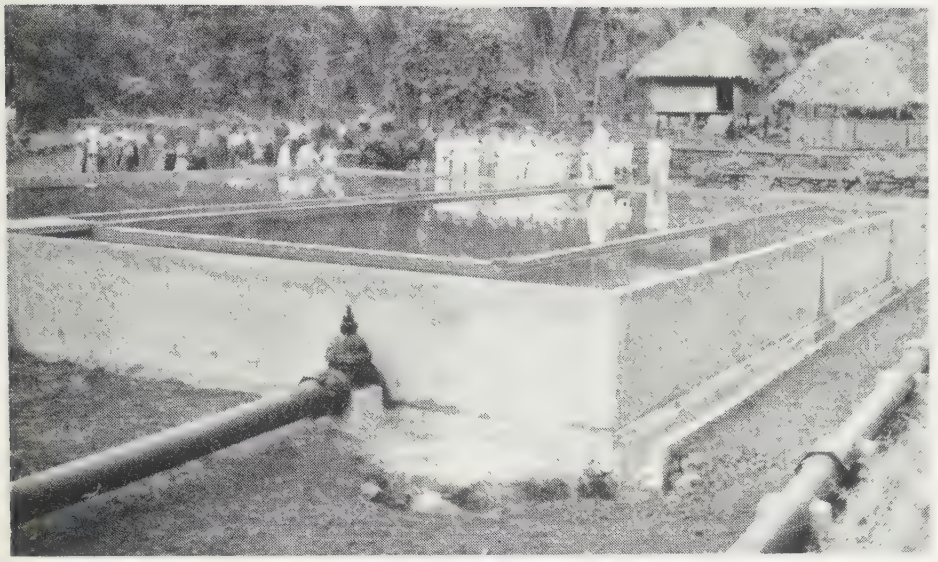
Some systems combine speed of longitudinal advance reduced to 2 millimetres per second with an ascensional speed, sedimentation areas and retention periods conforming to the above standards.

The clarified water is discharged over a sill into buffer-reservoirs or storage basins arranged either alongside the sedimentation basin, or else beneath it, or further downstream. The chief purpose of the storage basin is to accumulate the "night output"; the buffer-reservoirs are intended only for peak periods.

The arrangement of the sedimentation facilities ensures extensive exposure to the sun. The watercourse, which scarcely exceeds a depth of one yard, is therefore subjected to the maximum to the sterilising action of light. The settled water in then stored in separate reservoirs which are covered and closed. Exposure to the sun, however, facilitates development of algae, against which no *free* remedy has yet been found. The algae are removed by brushing the inner surfaces of the sedimentation basin when they receive their twice-monthly sluicing.

In certain basins, which are unfortunately only too few, algae are removed naturally during part of the year; from May to November, during the spawning season, myriads of fry run up. These are the well-known "inaa" of which the Tahitians are very fond. These fish, which are about 1 to 2 inches long, invade the sedimentation system and devour algae and mosses, thus keeping the inner wall in a state of perfect cleanliness. The fry never penetrate into the distribution pipes, since they fear the dark, and they always swim against the stream.

Most sedimentation systems have been constructed for output capacities of 1 to 3 gallons per second. Larger ones do exist, that of 7 gallons per second, serving Uturoa (Raiatea Island), that of 13 gallons per second serving the Pirae



Officials listening to explanations by a technician during a visit of inspection of the static sedimentation basin in the Vainahoata Valley, supplying the suburban districts of Pirae and Arue. Output capacity is 11 gallons per second.

and Arue districts, Eastern suburbs of Papeete, and that of 15 gallons per second serving the Western suburbs of Papeete-Paea, Punaauia and Faaa. It is mainly for systems of this type that the standards quoted above are applicable; for lesser systems they must be exceeded.

A detailed technical description cannot be given within the scope of this article. This information is available for any technician who may be interested.

The technical departments of the territory have thus been able to ensure water distributions with a minimum of supervision costs. A few larger systems, however, are given permanent supervision and maintained in constant state of cleanliness requiring daily attention. Others are paid weekly visits by local assistants. Yet others, particularly in Tahiti, are under the supervision of a mobile team. Others finally are left to the responsibility of the people, and their leaders.

* * *

The quantity of water to be supplied and the full capacity to be attained within two generations by systems yet to be constructed are closely linked, and are studied together.

The daily allowance of 75 gallons per person is to be taken as being for 12 hours of diurnal consumption. It corresponds to an outflow of one-seventieth of a pint per second per inhabitant; thus a village of 500 inhabitants will need resources providing 1 gallon per second for normal supply. In studying these resources, account has been taken not of the present population but of the figure it will reach within 50 years. In order to estimate this, the population in each area has been assigned an increase coefficient, based on statistics, and adjusted according to special local factors, such as prospects of economic and social development. These coefficients of population increase thus vary between 1.5 and 3.65; the general average over the whole of the territory is 2.25.

The actual resources in each sector are sometimes lower than the above defined optimum allowances. This has been partially remedied by constructing storage basins which retain "night output" and often make it possible practically to double the catchment output.

The optimum allowance of 75 gallons per day per inhabitant might seem overgenerous. It corresponds to more than twelve times the consumption of inhabitants of large European towns. But taking into account climatic conditions, this estimate would seem to be reasonable. Furthermore, it is more than exceeded in practice. The fact that no charge is made results in a great deal of waste, which is to be expected in view of the naturally carefree attitude of Pacific islanders who do not suspect that water supply is regulated by definite laws.

This waste is further increased by the fact that water is supplied most often under very high pressure (12 to 20 pounds at the beginning of the water-mains) in systems which are always linear, and extending lengthwise along the main road around the island. Intended to work to full capacity within 50 years only, the water supply system has, because of the pipe-lines diameter, an output in excess of present requirements and pressure is not always sufficiently reduced by the outflow. As experts in hydraulics know well, waste increases almost proportionately to the pressure.

This over-abundance leads to carelessness. Thus daily consumptions of between 200 and 250 gallons per day per inhabitant are recorded, about two-thirds of which is wasted. But, as soon as consumers are aware that some measure of control has been instituted, consumption falls to normal: 60 to 70 gallons per inhabitant. There is only one remedy for this—a rate of charge—and one palliative—installation of pressure regulators. These problems are being looked into. For the time being regulations have been issued making district chiefs responsible for the proper distribution of water amongst their people, always providing of course that the technical departments have fulfilled their functions properly. The chiefs and their assistants may take measures to cut down waste and to ration water in case of shortage. These arrangements have given good results up to date, since the islanders, who are careless in the face of abundance, are able to discipline themselves in time of want. This is a well-known characteristic feature of the Tahitian, and an important factor in many other situations.

* * *

The fourth aspect of the problem, as mentioned earlier, is not to be content with merely making water available to rural populations, but to supply it to them directly.

The works department has installed the necessary pipe-lines from the mains to every occupied house and provided a tap. Private installations were the consumer's responsibility if he required them. In any case, running water was brought to the door without any cost.

This conception has been much discussed and bitterly criticised. But the administration considered that therein lay the true means of making this extensive scheme worthwhile, by forcing everyone to use water which is the basic principle of hygiene. It has been calculated that the costs of diverting water to individual homes accounted for only approximately 2 per cent of the total expenditure. The result was well worth the effort.

Even better, an attempt was made to distribute supplies out to small communities, isolated from the main road. Water points were installed on the application of any land-owner who expressed his intention to build. Everyone's wishes were consulted, anticipated, and complied with; each area was thus dealt with fairly thoroughly before being considered as completed.

The results have often been spectacular. Inhabited areas have spread out far and wide. Houses have sprung up on land formerly uninhabited through lack

of water. Promiscuity has been reduced in certain communities set up around natural water points. Sub-division of land has finally put a stop to a number of cases of joint possession. The establishment of systems deep in the valleys has necessitated the construction of roads which have opened up rich new areas for agriculture.

These developments were brought to a premature halt with the introduction of the second four-year plan. This was, in fact, essentially an economic plan, while it was felt that rural water development was of a specifically social nature.

What has been achieved is nevertheless considerable.

In four years, 53 systems have been constructed or rebuilt. They comprise 150 miles of mains, 22 systems already in operation still remain, with miles of pipe-line. The territory of French Oceania thus possesses at present 75 district water supply systems, with a total of 200 miles of mains.

The funds devoted over four years amount to £stg.630,000. The population served by the newly-built system is estimated at 22,000 inhabitants, working out to an expenditure per head of about £stg.28.

But these installations are, as we have seen, capable of serving about 2.25 as many more inhabitants; expenditure will thus drop to about £stg.13 per head. These figures are comparable to those given for France, despite local conditions which are to our disadvantage. It should be noted that the majority of rural labourers were paid at the usual rates, either in kind or partly in kind, partly in cash. In other cases a contract system was adopted. For transporting loads uphill a curious method of remuneration per pound per yard was imitated from the ancient theories of "animated motors", and found to be most effective.

On the whole, labour costs rose to about 20 per cent of total expenditure. This work has given occasion for a number of consultations between the technical departments concerned and the Department of Health, in view of the importance of matters pertaining to social hygiene.

From this operation arose the study of the relationship between the damage caused by dental caries in the territory and the fluorine content of the water supply. An attempt to establish the above relationship has been made by Dr. Acker, whose very extensive work is to be published shortly. The South Pacific Commission has expressed its interest in this matter by allotting a grant-in-aid for the chemical aspects of this research.

It is probable that the conclusions reached will lead the technical departments to attempt artificial fluorination of the water in the main areas of distribution.

* * *

A figure has been given for the original programme; 25 areas have yet to be equipped; anticipated expenditure is in the region of £stg.395,000.

Public opinion is anxious to see the work completed. It is not impossible that with the combined amounts obtained from the local investment budget, the second four-year FIDES plan—some appropriations of which may be reconsidered—and a system of loans, these projects might be continued.

Steady Increase In Pacific Periodicals

THE number and attractiveness of local publications circulating in the South Pacific has been steadily increasing of recent years, and today there is hardly a territory without at least a modest news-sheet of its own.

While before World War II there were many commercial ventures into newspaper publishing in the islands, these catered almost exclusively for European residents. Few, with the notable exception of the veteran *Fiji Times and Herald*, were a sustained financial success.

Of recent years, however, Governments, missions and community organizations generally have become increasingly aware of the importance of providing accurate and up-to-date news and information of all kinds as an essential educational extension service. The teaching of literacy is now recognized as valueless without the provision of literature; and, as the South Pacific Literature Bureau has always recognized, books alone are not enough, for there are needs which can be met adequately only through a live periodical press. This is particularly true in the special and difficult circumstances obtaining in the Pacific.

Some of the most attractive of the new ventures are school magazines, often written by the scholars themselves. The New Hebrides *Na Vara*, published by the Coopérative Scolaire Port Vila, *L'Ecole Publique* from New Caledonia, and the *Yap Intermediate School News* are experiments of special interest in this field. Others, like *Tumu Korero*, the organ of the Ngatangiia Community Centre of Rarotonga, are produced by the local effort of enthusiasts. Still others are Government "house organs", with limited circulation, mission magazines or the journals of scientific societies.

For the most part, however, the periodicals circulating in the islands are published by the local administrations for the information of the general public. This quarter we welcome two outstanding newcomers in the *Cook Islands Review* and *Triton*; may each have a long and successful life.

The *Cook Islands Review* is a newspaper-format 10-page monthly printed in English and Maori. It features island news and views, including sporting events, from all parts of the Cook Group, together with general reading matter. The first number appeared in December, 1954, the subscription being 6/- (N.Z.) per annum, post free. Publishers are the Cook Islands Administration, and distributors, the Cook Islands Trading Co., of Rarotonga.

Triton is a beautifully produced and well-illustrated 12-page monthly magazine published in Malay for the people of Netherlands New Guinea. The contents include a summary of world news,

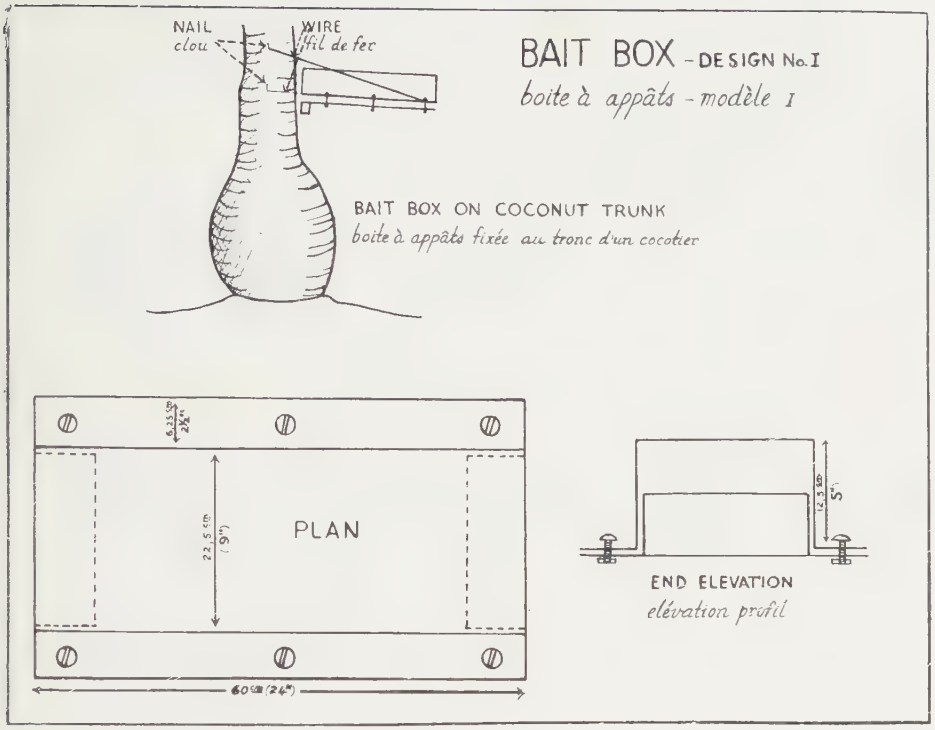
(Continued on page 35)

Campaign Against Alcoholism In New Caledonia

THE Health Department of New Caledonia and Dependencies is planning a campaign against alcoholism among islanders.

A request was made to the Commission to provide the necessary visual aids, and accordingly, the poster reproduced below was prepared. This poster measures approximately 20" x 12". It was designed and printed in Nouméa in three colours. Including production costs, the first 1,000 copies worked out at around 7 francs CFP (10d. Stg.) each.

Rat Poisoning In French Oceania



The information contained in this article was made available through the courtesy of Mr. Millaud, Director of Agriculture, French Oceania, and Mr. Daguenet, who is in charge of the rat poisoning campaign.

By L. J. DUMBLETON

Plant and Animal Quarantine Officer
South Pacific Commission

IN French Oceania the Department of Agriculture is endeavouring to institute a comprehensive rat control scheme. The banding of trees and poisoning are the methods being used.

In the high islands such as Tahiti it is the intention to rely on tree banding as a means of control[1]. It is considered that on these islands rats could not be controlled in the large areas of scrub and forest inland from the coconut areas, and the recurring expense of poisoning would be high and the results not completely satisfactory.

In the low islands the Department of Agriculture is relying on poisoning alone for rat control. A departmental officer, Mr. Daguenet, has been engaged during 1953 and 1954 in supervising and carrying out a poisoning campaign on Fakarava Atoll in the Tuamotu Group. On Fakarava the species responsible for the damage are said to be *Rattus rattus alexandrinus*, and *R. r. frugivorus*. *R. norvegicus* is present in at least some villages. It is stated that where only the Polynesia rat *Rattus exulans* is present, no damage is done to coconuts. It is believed that rats destroy 50% of the coconut crop on Fakarava, and in some localities 75% - 100% of the crop is destroyed.

The costs of the poisoning campaign have been met by the Administration. The owners of plantations have been called on to supply only labour. The costs of poisoning are estimated to be about 112 francs C.F.P. per hectare (5/- stg. per acre). At present prices, an increase of 20% over the present copra yield would recover the cost of poisoning in one year.

Poison Bait Details

Warfarin is used as the rat poison. The French product costs about 157 francs C.F.P. per kilo (7/- per lb.). It is used in the proportion of one part by weight to 19 parts of desiccated coconut. The latter has been obtained from a factory in Tahiti at a cost of 11.5 francs C.F.P. per kilo (6d. per lb.). The desiccated coconut is dried or lightly roasted in an oven before use in order to maintain its palatability over a longer period by delaying and reducing the incidence of deterioration due to moulds.

This appears to be the first large-scale use of coconut meat as a carrier or base for a poison bait containing warfarin, though it has been used previously with zinc phosphide. This development is interesting because it would appear probable that the feasibility of employing poisoning for rat control under Pacific conditions will largely depend on the employment of a cheap and readily-available local product as a carrier or base for the poison.

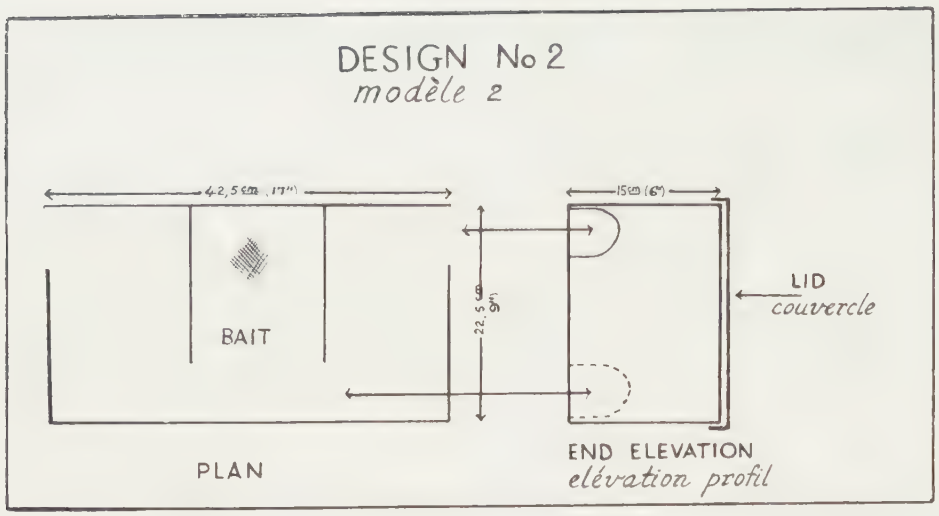
The poison bait is used at the rate of 5 kilos per hectare (4½ lbs. per acre). The number of feeding stations, or points at which the poison bait is laid, varies with terrain and other conditions. Ordinarily in well-kept coconut areas three to five feeding stations per hectare (one to two per acre) were used. In large areas of scrub or forest the feeding stations may be spread 200-500 metres (200-500 yards) apart. The feeding stations are galvanised iron boxes allowing ingress to the rats while protecting the poison bait against deterioration due to rain. Two designs have been used.

The first type of box, which was designed by Mr. Millaud, consists of two pieces which are fastened together by three small bolts along each side. One piece forms the flat base about 60 cm. x 35 cm. (24" x 14") which is bent up vertically at each end to form two end walls 22.5 cm. (9") wide and 6.25 cm. (2½") high. The bait rests on the base and is protected from spillage and rain by the two vertical end walls. The other piece is bent to form an open-ended flat cover 22.5 cm. (9") wide with vertical side walls 12.5 cm. (5") high which are again bent outwards to form horizontal sidepieces 6.25 cm. (2½") wide for bolting the cover to the flat sides of the base.

The rats enter the box by the space left between the cover and the top of the raised end walls of the base. The box can be fixed end on, horizontally, to the trunk of a coconut palm, by means of wires taken from four nails in the trunk to the first and last bolts along each side.

The second type of box is approximately 42.5 cm. long by 22.5 cm. wide (17" x 9") and has two internal transverse partitions. The bait is placed in the central compartment. An entry hole is cut in each end wall and internal partitions to give entry to the two end compartments and the central compartment.

1 The use of tree bands to prevent rats attacking coconuts is dealt with in an article by M. R. LASSALLE-SERE appearing elsewhere in this issue.



and so arranged as to reduce the possibility of the bait being dragged out and to require the rat to cross diagonally the end compartments. The positional arrangement of these entry holes will be better seen from the sketch. The box is covered with a close-fitting lid. Because of interference by animals, especially pigs, it was found desirable to mount the feeding stations either on palm trees or on wooden stands.

Warfarin baits must be available to the rat population over a period of 10-14 days, and this requires either the regular replenishing of the bait in the stations or the placing of an initial amount which is sufficient to feed all the rats present and which will not deteriorate owing to mould growth or other causes.

In some cases where it was difficult to revisit the stations for refilling, 44-gallon drums, each containing 15 kilos (35 lbs.) of bait, have been used at the rate of one per 3 hectares (one per 7 acres). The results are stated to be excellent. For example, two small islands (one of which was of 100 hectares—250 acres) were poisoned in January 1953. The yield of copra (obtained from traders' records) in the May, June, July, 1953, harvest was 3090 kg. (3.1 tons). An inspection in January 1954 revealed no damaged nuts, and the copra yield for the February, March 1954 harvest was 7941 kg. (7.8 tons). The yield was more than doubled in the first year, and the increased return was more than sufficient to meet the cost of the treatment.

The poisoning campaign in the Tuamotus goes some way to providing experience of practical control measures under Pacific conditions. Little or no information is available, however, on the frequency with which poisoning will have to be undertaken and the cost of the follow-up or maintenance poisonings. This must be available before a comparison of the cost and efficiency of banding versus poisoning can be made.

Advantages of Banding

Banding has the advantages that it uses no perishable materials, that it requires to be done only once every 10 years or so, that the idea is easily grasped by the people, relatively little organisation and supervision being required, and that it can be successfully employed by an individual owner, even if his neighbours do not undertake control measures.

If poisoning is to be employed on low islands it is desirable that information should be obtained on the possibility of preparing on the islands, with local resources, a desiccated or shredded coconut product which would save the purchase and freight costs on factory-made desiccated coconut. Similarly, if bait stations could be constructed of local materials it would be a great advantage.

Rural Malaria Control

(Continued from page 7)

in a pilot project to determine its effect against malaria transmitted by these same anopheline mosquitoes. It was cautiously reported to the Conference that in this experiment, covering a population of about 5,000 people, the results were promising—only one infant, born two months after the first spraying, was found to have been infected with malaria.

In addition, experimental houses have been used to make close observation on the behaviour of the anophelines near Hollandia. Further observations have been made in Papua and New Guinea on the resting habits of the malaria vectors. On this evidence the Conference found that there was promise of control by insecticides in New Guinea.

It was noted that in the New Hebrides, where residual spraying with DDT has been adopted as a wartime method of control, this method has been satisfactory in the contr[illegible] of malaria in recent years.

It is not possible to report fully the proceedings and findings of the Conference, which will be published as a report by WHO. In discussing some of the recommendations and conclusions of the Conference those which directly affect the South-West Pacific area will be presented first; then the more general items, which equally affect this area, will be mentioned.

The Conference recommended that the experimental work on the control of malaria transmitted by the *Anopheles punctulatus* group (the vectors in the South-West Pacific) be continued and extended to other areas. It should be noted here that a pilot project using the insecticide "dieldrin" has already been proposed for the territory of Papua and New Guinea.

The Conference concluded that more information is needed on the sensitivity of benign tertial malaria to the drugs primaquine and pyrimethamine, drugs which may be able to eradicate this relapsing infection from the body.

Of special interest to several of the areas in the South-West Pacific was the recommendation that chlorinated hydrocarbon insecticides be not used concurrently or consecutively against adult and larval anophelines. This subject has already been discussed in considering the development of resistance by anophelines to DDT, but it should be pointed out that DDT is, at present, widely used as a method of larval control in the South-West Pacific area. If, as seems likely, residual spraying is to be used as the method of control of rural malaria in this area, larval control measures should be changed to the use of oil alone or Paris green.

The Conference recommended that national malaria services be set up with appropriate authority and full technical responsibility in the field of malaria control, and that malaria advisory committees be established to co-ordinate all plans and activities of malaria control within the country. Governments were commended to establish strong central and peripheral facilities for training malaria workers.

The final recommendation of the Conference was that the ultimate goal of a nation-wide malaria control programme is the eradication of the disease.

In conclusion, the evidence presented to the Conference clearly indicated that "no country with a serious malaria problem can afford *not* to control malaria."

[The Conference was held at Baguio City in the Philippine Islands from 15 to 24 November, 1954. There were 42 participants from 13 different countries and territories. Malaria workers from the South-West Pacific area were Dr. H. de Rook and Dr. D. Metselaar from Nethelands New Guinea and Dr. R. H. Black from Australia. In addition, Professor L. E. Rozeboom, who worked in the area in the war years, was present. It is certain that this international meeting with its discussions of shared problems will have an enormous benefit in the campaign to eradicate one of the world's most important diseases—malaria.]

Pacific Subsistence Crops . . .

TAROS

Amorphophallus Colocasia Cyrtosperma Alocasia Xanthosoma

The fifth of a series of articles on subsistence food plants in the South Pacific

By EMILE MASSAL and JACQUES BARRAU

Executive Officer for Health | Subsistence Agriculture Officer
South Pacific Commission

IN the strict meaning of the word, taros* are tuber-producing araceae with edible leaves belonging to the genus *Colocasia*. Two main species, *C. antiquorum*, Schott and *C. esculenta*, Schott, are generally listed, although the validity of such a distinction is questioned by some botanists, including Albert F. Hill, who consider both as being merely varieties of *Colocasia esculenta*, (Linn.) Schott. However, the inflorescences show morphological differences, illustrated by the accompanying sketch (Fig. 1).

In a wider sense, other plants of the same family are sometimes called taros; there is resulting confusion which should be cleared up. These other araceae with edible tubers, combined together with the *Colocasia* under the same name are:

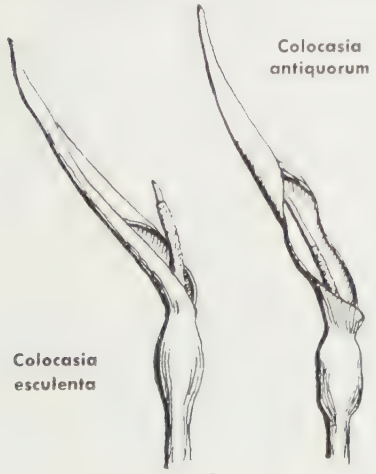


Fig. 1

The *Alocasia*: the most common species is probably the ubiquitous *Alocasia macrorhiza*, Schott, known as "oht" on Ponape, "ape" in Tahiti, "kape" in the Wallis Islands, and on Uvea in the Loyalties, "wave", "pindu", etc., in New Caledonia, "Viagaga" and "Viamila" in Fiji.

The *Cyrtosperma*: the species *Cyrtosperma chamissonis*, (Schott) Merr. is essentially the taro of the atolls of Micronesia; it is known as "babai" in the Gilberts. *Cyrtosperma* which are used as food, are also to be found on the northern coast of New Guinea, in the Solomons, Fiji and Polynesia. They are known by the native names of "muhang" on Ponape, "kakake" on Malaita, "viakana" on Viti-Levu, "maota" or "ape veo" in Tahiti;

The *Xanthosoma*: these were undoubtedly only introduced fairly recently into the South Pacific area, but they are grown in an increasing number of islands, particularly in Melanesia. The names "kongkong taro" (meaning "China taro") in New Guinea, "New Hebrides taro" in New Caledonia, "Fiji taro" in the New Hebrides, "dalo ni tana" in Fiji, etc., indicate the complexity of channels of introductions. On Ponape they are called "sawah-n-awai" and "tarua" in Tahiti.

Amorphophallus campanulatus, Blume; nowadays these tubers are hardly ever used in human diet, but in certain territories of the Pacific, at any rate, the species seem formerly to have had much greater importance as a subsistence crop. It is known as "teve" in Tahiti and the Marquesas, "daga" in Fiji. In New Caledonia, it is known as "koe" in the Paati dialect and as "pwea" in the Camuki dialect.

In the natural state these various araceae grow in damp or swampy places.

1. Sterile appendage.
2. Male flowers.
3. Abortive flowers compressed by the neck of spathe.
4. Female flowers.
5. Spathe cut lengthwise to show inflorescence.

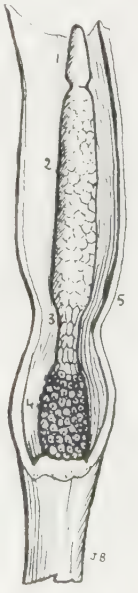


Fig. 2 — Colocasia esculenta inflorescence.

* An annotated bibliography on taro was published in the October 1953 issue of the **Quarterly Bulletin**, vol. 3, no. 4. Editor.

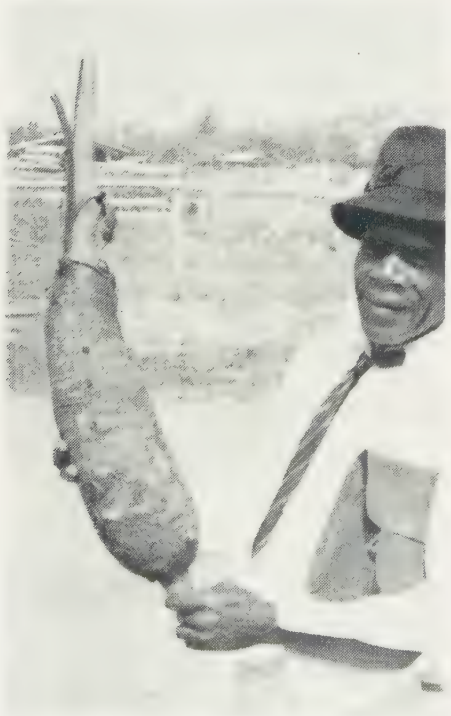
Colocasia esculenta, Schott. Mele, Efate Is., New Hebrides.

always shaded. In his methods of cultivation man has sought to reproduce these conditions which are often of the utmost importance for the healthy growth and production of these araceae.

All these "taros" are, in the wider sense, herbs. Some, however, such as *Xanthosoma sagittifolium,* Schott., or *Alocasia macrorhiza,* Schott., may have a short thick stem, of woody appearance. The leaves, which are ensheathing, vary in form, those of the *Colocasia* being peltate, of *Alocasia, Cyrtosperma* and *Xanthosoma* sagittate and *Amorphophallus campanulatus* divided. The inflorescence is a spadix, kind of fleshy spike, enclosed in a form of leaf called a spathe; the accompanying sketch of an inflorescence of a *Colocasia esculenta,* Schott., gives some idea of this and illustrates the arrangement of male and female flowers on the spadix (Fig. 2). This separation of male and female flowers is usual with the araceae, but in a few cases, notably that of the *Cyrtosperma,* the flowers which are always grouped on the spadix, are bi-sexual. Laticiferous cells are present in stems and leaves of some of these plants, which explains the characteristic flow of "milk" when a *Xanthosoma* leaf stalk, for instance, is cut.

Colocasia, Alocasia and *Amorphophallus* very likely originated in tropical Asia, whilst the *Xanthosoma* are native to America; the *Cyrtosperma* are met with more or less everywhere in the tropics; It is thought, however, that *Cyrtosperma chamissonis,* Merr., probably originated in Indonesia.

Alocasia macrorhiza, Schott. Uvea, Loyalty Is.



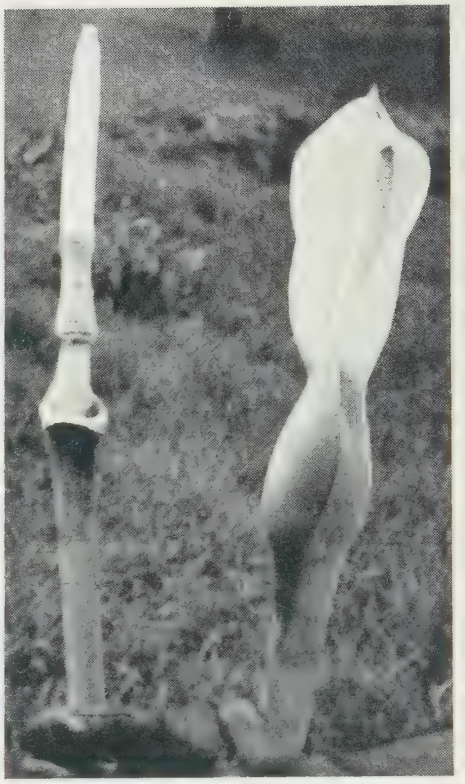
Colocasia tuber. New Caledonia.

Three Commonly-Grown Species

In the South Pacific "taros" are used in human diet in Melanesia, Micronesia and Polynesia. Varieties of *Colocasia, Cyrtosperma* and *Xanthosoma* are the most commonly grown; these species, therefore, deserve a more detailed study

In general, *Colocasia* tubers constitute the most important common food in South Pacific territories. This particular taro is the staple food of rain forest dwellers in New Guinea, the Solomons, and the New Hebrides. It is one of the basic subsistence plants in New Caledonia and Fiji, in the Southern Group of the Cook Islands, in the Tubuai Group and on Rapa Island. Elsewhere, with the exception of coral atolls, it is often present in the diet, as a supplement to the various staple foods.

Colocasia taros are generally propagated by cuttings taken from the top of the tuber and grown with irrigation, or by dry cultivation in areas with a fairly high rainfall. They produce from three to six tons of tubers to the acre within seven to twelve months from planting, that is approximately 2,300,000 to 5,200,000 calories. When grown with care and under irrigation, as in a num-



Inflorescences of Alocasia macrorhiza (one without spathe). Viti Levu, Fiji Is.

Xanthosoma sagittifolium, Schott. Col de la Pirogue, New Caledonia.

Left: Xanthosoma inflorescences (one without spathe). Mele, Efate Is., New Hebrides.

Right: Inflorescence of Cyrtosperma. Viti Levu, Fiji Is.

ber of territories, yield can be as high as eight tons per acre; (in Fiji, W. J. A. Payne mentions a yield in the region of 8,600,000 calories per acre).

The *Cyrtosperma* are amongst the rare subsistence plants which will grow on atolls. In the Gilberts, amazing methods are used for growing "babai." A ditch is dug deep enough to reach the fresh-water lens and the "taros" are planted in the mud at the bottom. As they grow, the islanders weave a basket around the plant and fill it with humus collected from beneath nearby undergrowth. This pot cultivation produces enormous tubers but takes several years, since the growth of *Cyrtosperma chamissonis* is slow. In the Solomons, however, where *Cyrtosperma,* grown in the coastal marshes, is the type of "taro" eaten by the inhabitants of the artificial islands along the Malaita coast, harvesting takes place earlier, but the yield seems proportionately lower.

The *Xanthosoma,* although only introduced into most territories during the XIX century, nevertheless occupy an important place in the vegetable food pattern, being easy to grow. Semi-perennial groves can be established with very little effort by planting these tubers, preferably in alluvial soils and harvesting from them as required.

Xanthosoma has thus become one of the bases of native subsistence wherever cash crops—coffee on the East coast of New Caledonia, cocoa in the Gazelle Peninsula of New Britain—are grown by the islanders. The average yield of *Xanthosoma* is estimated at eight tons to the acre, i.e., around 8,000,000 calories. *Xanthosoma* tubers will keep for several weeks if placed in a dry, dark and cool place, a definite advantage over tubers of other genera. The young leaves of *Xanthosoma,* like those of the *Colocasia,* are edible and highly appreciated.

Comparative Nutritive Values

The following average nutritive values have been drawn from a number of food composition tables:—

Tubers

	Colocasia and Xanthosoma	*Amorphophallus campanulatus*
	Per 100 grammes of edible portion.	
Water	72.5 gm.	78.7 gm.
Proteins	1.9 ,,	1.2 ,,
Fats	0.2 ,,	2.1 ,,
Carbohydrates	24.0 ,,	18.4 ,,
Fibre	0.8 ,,	0.8 ,,
Ashes	1.3 ,,	0.8 ,,
Calcium	30 mgm.	50 mgm.
Phosphorus	80 ,,	20 ,,
Iron	1 ,,	0.6 ,,
Vitamin A	30 I.U.	434 I.U.
Thiamin	0.04 mgm	0.06 mgm.
Riboflavin	0.03 ,,	0.075 ,,
Niacin	0.4 ,,	0.7 ,,
Ascorbic Acid	10 ,,	traces
Calories	100 ,,	79 ,,

Leaves *Colocasia and Xanthosoma*

	Per 100 grammes of edible portion
Water	87.0 gm.
Proteins	3.5 ,,
Fats	0.8 ,,
Carbohydrates	7.4 ,,
Fibre	2 ,,
Ashes	1.5 ,,
Calcium	150 mgm.
Phosphorus	59 ,,
Iron	1 ,,
Thiamin	0.1 ,,
Ascorbic Acid	25 ,,

Cultivation of Cyrtosperma chamissonis, Merr. Tarawa atoll, Gilbert Is.

These figures call for some comment. The mineral and vitamin contents taken from various tables vary considerably: we have given those listed by L. Nicholls.

In the report of the 1947 New Guinea Nutrition Survey Expedition, the following values, per 100 grammes of edible portion, are given for the South Pacific:

Colocasia and *Xanthosoma* Tubers:

Water	63.9 gm.
Carbohydrates	33 „
Calcium	39 mgm.
Calories	145 „

Colocasia antiquorum Leaves:

Calcium	17.2 microgrammes
Oxalic Acid	9.1 milligrammes

The following provisional values per 100 grammes have been obtained by Mr. F. Peters in the Commission's biochemistry laboratory, in respect of taros harvested in New Caledonia where the preliminary preparation for analysis consisted merely of scraping their surface:

	Colocasia antiquorum	*Xanthosoma sp.*
Water	53.4 gm.	58.8 gm.
Fats	0.5 „	0.5 „
Reducing Sugars	0.6 „	0.2 „
Starch	34.4 „	34.4 „
Ashes	0.9 „	1.3 „
Fibre	14.3 „	10.1 „

Taros, in the wider sense, are therefore a valuable source of calories. The protein content is low; the amino-acid composition remains to be studied. The quantity of fats is negligible. The table below, borrowed from Miss Carey D. Miller, show the quantities of thiamin, riboflavin, niacin and calcium contained in various foodstuffs, for weights with a calory content of 100.

The thiamin content (vitamin B1) adequately balances the calorific value. The other group B vitamins and ascorbic acid (vitamin C) are present in appreciable quantities. The mineral salt contents are fairly satisfactory. It should, however, be noted that the high rates of oxalic acid in the leaves and stems are liable to prevent assimilation of calcium.

Certain araceae, when raw, contain poisonous and bitter elements, probably saponins, which are generally destroyed by cooking.

The tubers and leaves of the majority of species and varieties contain microscopic capsular formations enclosing calcium oxalate crystals. These crystals, which are shaped like fine needles, are set free explosively by mastication or maceration. They set up irritation of the buccal and pharyngeal mucous membranes, thus making the consumption of these varieties practically impossible without prolonged cooking.

The pigment of the yellow varieties is formed by carotenoids; the red pigment belongs to the anthocyanine group, soluble in alcohol.

As with all tubers, taros alone could not meet man's nutritional requirements unless eaten in very large quantities. A ration of 6 lbs. of taros, giving about 3,000 calories, would provide approximately 2 oz. of vegetable protein, 0.2 oz. of fats, and about 25 ozs. of carbohydrates. There is no need to dwell upon the lack of balance in such a ration. In practice, these tubers are eaten in conjunction with other foods rich in protein, fats, minerals and vitamins such as fish, coconuts, vegetables and greens.

The methods of cooking *Colocasia* tubers and preparations with this taro as base vary very little. Whole tubers may be roasted on hot stones, baked in the native oven, or boiled in water. In the latter case, the tubers are peeled and normally cut into pieces before cooking and a large part of the water-soluble minerals and vitamins is thus lost if the cooking water is not used.

Sometimes the raw tubers are washed, peeled and grated. This pulp, to which coconut cream is sometimes added, is wrapped in leaves and cooked in the native oven or boiled.

For the New Caledonia "bounya", or native feast, *Colocasia* tubers are washed, peeled and cut in slices; then coconut cream, and chicken or fish are added. The mixture is wrapped in leaves and cooked in a native oven.

When cooked, taro tubers are often mashed into a paste, coconut cream being sometimes added. The mashing, which is done in special wooden mortars, is generally a lengthy process. On Rapa, in the Austral Islands, the womenfolk mash the tubers on large flat stones along the riverside. This is followed by kneading for a lengthy period, during which hydrolysis probably occurs in the starch, giving the dough a light, fluffy texture and a pale mauve, almost pink, colour. It is generally shaped into balls and eaten seasoned with coconut cream. Occasionally the dough is left to ferment from one Islanders call "tioo." After re-cooking in the native oven, wrapped in leaves, this dough will keep for several days. A similar process of semi-preservation of cooked dough is also practised in the Gilberts with "babai."

On Pentecost Island in the New Hebrides, tubers are slowly baked in the oven of hot stones. A thick "crust" is formed and the tubers, which are thus semi-preserved, are used as food on journeys.

In the Gilbert Islands, *Cyrtosperma* tubers are sometimes scalded, then chopped and dried in the sun. They can be preserved in this way for several months.

The leaves and young stalks of *Colocasia* and *Xanthosoma* are highly re!-

Amorphophallus campanulatus tubers. New Caledonia.

	Weight giving 100 calories	*Thiamin*	*Riboflavin*	*Niacin*	*Calcium*
	gm.	mcg.	mcg.	mcg.	mg.
White flour	26	20	8	226	5.4
Polished rice	28	25	8	560	2.5
Polished, washed and cooked rice	28	5	—	390	2.5
Sweet potatoes	80	80	48	559	24.0
Breadfruit	70	96	59	720	14.7
Taro (Colocasia)	70	149	25	424	16.0

ished. The Tahitian "pota" is prepared in the following way:

The taro leaves are carefully washed, the stalks scraped and cut into sections, then boiled for a long time. A layer of boiled taro leaves, and then a layer of cooked chicken, or occasionally ham, are laid on a foundation of banana leaves; lemon juice and coconut cream are sprinkled over it; salt and pepper are added. Leaves and chicken meat are placed in alternate layers. This is made into a bundle and cooked in the native oven. It is a traditional dish which appears on all festive occasions.

The poor preserving qualities of doughs and pastes made with *Colocasia* tubers, and their unattractive appearance and texture, have led Hawaiian authors to seek other methods of taro preparation. Their efforts have been mainly directed toward obtaining flour.

The trials carried out by John H. Payne, Gaston J. Ley & George Akau, at Honolulu from September 1935 to April 1937, using semi-commercial laboratory equipment, have shown that a satisfactory product might be obtained by the following series of operations: cooking the taro, peeling, crushing, refrigeration, chopping, drying and powdering. This flour can replace from 15 to 20% of wheat flour in the preparation of a number of products—bread, grits, etc. It can be the base for water or milk-soluble powders suitable for infant, child, or invalid foods. Finally, taro dough can be kept for a very long time in sealed metal boxes without losing any of its qualities.

Scope for Introductions

Among the various taros studied above, the *Xanthosoma* and *Colocasia* are of particular interest in connection with the improvement of indigenous subsistence agriculture in South Pacific territories.

Easy cultivation and high yield make the various *Xanthosoma* valuable as excellent stand-by crops. Emphasis should be laid on finding varieties resistant to some fungal diseases as, for example, the rot caused by *Pythium irregulare*, which causes serious damage in New Caledonia. To this end, the South Pacific Commission has already arranged the introduction of other varieties of *Xanthosoma*, as well as various *Alocasia*, which are now under observation at the Plant Pathology Laboratory of the French Institute of Oceania, in Nouméa. It would also be of highest importance to introduce *Xanthosoma* species producing tubers of greater food value, such as *Xanthosoma atrovirens*, Koch & Bouché. Contacts have already been established by the Commission in this connection.

An inventory of the *Colocasia* existing in the area would make it possible to determine and propagate easily-grown and high-yielding varieties with good quality tubers; a good example is provided by the variety of *Colocasia esculenta*, called "Dalo Samoa" in Fiji, and by another Fijian variety called "Vavai." Some South Pacific *Colocasia* offer special characteristics, such as a possible tolerance of salinity in the case of the "Niku" taro of the Purari Delta, in Papua. Finally, following the lines already indicated for *Xanthosoma*, varieties capable of resistance to fungal diseases should certainly be developed in some territories; in this respect, the strains of *Colocasia* observed to resist

Xanthosoma introduced from New Guinea in the observation plot of the plant pathology laboratory, French Institute of Oceania, Noumea, New Caledonia.

Phytophthora colocasiae on Bougainville could profitably be introduced and propagated in the Western part of the British Solomons, where this disease has practically wiped out taro cultivation.

The search for better varieties of *Colocasia* should not be confined to South Pacific territories. Some varieties from outside the region are of great value, such as the Japanese variety called "Tsurunoko" or "Araimo", which is grown in Hawaii; it is a hardy, quick maturing taro, capable of growing on dry land, and producing tubers with good keeping qualities.

The fact that the *Colocasia* taro is found in all the Pacific islands, is used commonly in diet and has real nutritional value, especially in conjunction with fish and coconut cream, and can be used commercially in the form of flour or by-products, justifies the numerous studies made on it to date and calls for still further investigations. In addition to the development and introduction of improved varieties, there is scope for studies of preservation methods and of the protein complex as far as its amino-acid composition is concerned. These latter aspects will certainly be receiving the attention of both the Commission's food technologist and biochemist.

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Santa Gertrudis Bulls For Fiji

FOUR Santa Gertrudis bulls bought in Australia by the Government of Fiji have arrived in the Colony. The Santa Gertrudis breed was originated in Texas. It is a stabilised Zebu-Shorthorn cross which is recognised as a hardy breed and particularly heat tolerant. It should, therefore, be well suited for the climatic conditions in Fiji. The breed is looked upon as a quick grower and it should result in the production of heavier and earlier maturing beef animals.

The bulls now in Fiji are the first progeny of a consignment of Santa Gertrudis cattle taken to Australia from King Ranch, Texas, in 1952, and they are the first to be exported from Australia. The Department of Agriculture plans to mate the bulls with a number of British breeds and crossbreds already in the Colony, and when suitable males of seven-eighths Santa Gertrudis blood are produced they will be available for distribution to cattle raisers.

Women's Committees of Western Samoa

. . . . . their role in village hygiene and in maternal and child welfare

By C. MONAGHAN
Health Sister, Western Samoa

Sister Monaghan explaining features of a South Pacific Health Service poster to a Samoan medical practitioner and a district nurse.

THE Women's Committees are such a unique feature of Samoan life and since their inception in 1925 have exercised such a vast influence on the improved health of the Samoan people and the decreasing infant mortality rate, that a brief account of their history, functions and activities should be of interest to other islands of the South Pacific where many of the health problems are similar to those of Western Samoa.

There is some reason to believe that the women of Samoan villages have long had certain communal responsibilities, chiefly in the matter of organizing and providing hospitality for visitors. However this may have been, they do not appear to have been generally organized for specific health purposes prior to 1925.

That year marked the real commencement of child welfare work in Western Samoa. Prior to this there was a very high mortality rate in the first two years of life—statistics assembled at this period giving a figure as high as 200 per 1,000 live births. The main cause of death among infants was infantile diarrhoea, due to ignorance on the part of the mothers concerning personal and environmental hygiene as well as wrong feeding at the weaning stage. Also, much of the ill-health among the children was due to yaws, which was widespread among the Samoans and affected nearly every child. Many of the mothers suffered severely from hookworm, which so debilitated them that they were unable to provide sustenance for the children.

These three diseases had been systematically attacked by the Public Health authorities during the two preceding years, so that when they were brought under control it was felt that proper child welfare work could be commenced with hope of success. Dr. Mabel A. Christie was appointed child welfare officer, with valuable assistance given voluntarily by Dr. Roberts, wife of the American Vice-Consul, who set out to visit the villages and teach the mothers the elementary rules of health and hygiene and simple home nursing.

In every village the babies and children were gathered together and inspected, Women's Committees formed, medicines given to the committees with directions for their use, and talks on subjects in connection with child welfare given to the mothers.

The committees were formed of the more enlightened class. The wives of native government officials and of native pastors of all denominations were the first to be included. Others were added according to the size of the village. A president was appointed by the women themselves, usually the wife of a chief who could exercise some authority over the affairs of the village.

These women took an active part in all affairs connected with the cleanliness of the *fale* (houses) and children, the treating of any sick babies or children, and the feeding of babies and children.

Every member of a committee had her duties assigned to her each week by the president. A bell was rung each night and morning, and all children needing medical attention were brought to the president's house, where medicines were dispensed. Other members were responsible for supervision of the daily baths of all children in the fresh-water bathing pool adjoining each village. Once a week a thorough inspection of the village, *fale* (houses), latrines, etc., was made and any person found with dirty surroundings or *fale* was reported to the *Pulenu'u* (headman).

The following rules were drawn up by the Infant Welfare Officer:—

Rules of the Women's Committees

1. DUTIES: Cleanliness of buildings. All *fale*, cook-houses, and latrines to be inspected at least once a week; any person who is not keeping such places clean and free from rubbish to be reported to the *Pulenu'u*.

2. Treatment of sick children night and morning at the house of the President of the Women's Committee, if such children are not confined to bed; children suffering from any sickness other than those which the committee have the knowledge to treat, to be taken to the nearest dispensary. All cases of yaws to be reported immediately to the *Pulenu'u*. All parents not giving their children proper treatment to be reported to the *Pulenu'u*.

3. The Committee shall help all expectant mothers and those who are suckling their babies.

4. The Committee must see that good food is available for young children. They should see that children at the breast are fed regularly and that no work on the part of the mother interferes with such feeding. If a mother has not enough natural food

for her baby, the committee must try to obtain suitable food for such baby.

5. The Committees should meet at least once a week to discuss matters in connection with the cleanliness and sanitation of their villages. The medical articles in the *Savali* (at that time the Government newspaper of Samoa) should be read every month not only to the committee, but to all the women of the village.

6. These are the chief duties of the Women's Committees, but the women can also do good work by taking an interest in such matters as the supply of good drinking water, the provision of bathing facilities, the construction of sufficient fly-proof latrines or latrines over the sea, the provision of playing area for the children, the keeping of pigs out of the villages, and the instruction of boys and girls in the importance of cleanliness in themselves and in their surroundings.

A group of Samoan mothers attending the clinic for guidance in the upbringing of their babies.

In the *Savali*, the Government vernacular newspaper published in Western Samoa once a month, several pages were devoted to health subjects. It was through the medium of this paper that written instructions on subjects that concerned child welfare in Samoa were circulated throughout the country, as each head of a family received a copy.

Some of the articles written dealt with:

Care of the Breast-fed Baby in Its First Twelve Months.
Common Diseases of the Samoan and Their Treatment.
Feeding and Hygiene of the Samoan Mother during Pregnancy and Lactation.
Work of the Samoan Mother during Pregnancy and Lactation.
Cleanliness of the Villages—Comprising Fale, Cook-houses, Latrines, Water Supply, and Exclusion of Pigs from the Villages.
Medicines Used by the Women's Committees, and Their Application.
Cleanliness of the Person, and Clean Habits.
Care of the Teeth.

In order that the Women's Committees would be able to treat minor ailments, they were supplied from the Medical Department with various simple remedies, together with advice on when and how to use them.

The foregoing note on the formation of Women's Committees shows the early realization there existed of the need for health education of mothers. Since then, the Women's Committees of Samoa have grown and strengthened, and are now an integral part of the social life of the people.

Although many of the rules laid down earlier have been altered in some details to conform with progress and changing standards, the basic principles remain the same.

With the increase of medical services, new dispensaries and out-station hospitals have been established all over Western Samoa. These are run by Samoan medical practitioners assisted by Samoan trained nurses and Samoan trained district nurses. The S.M.P.'s and district nurses work through the Women's Committees in each village, giving treatment and advice and carrying on the work of health education among the people.

Nearly every village has its own Women's Committee *fale*, kept specially for any nursing of minor ailments, and for the monthly clinics held there by the district nurses. Here are kept all the medical and nursing equipment needed to treat such cases under the advice of the S.M.P. or district nurse. In many of the more isolated areas of Samoa, all maternity cases are nursed by selected members of the Women's Committee in this special *fale*. These women have been taught to carry out the necessary procedures during confinement and the puerperium with a satisfactory aseptic technique and the women take a keen interest in learning and maintaining a good standard of nursing care.

Throughout the years, the Women's Committees have shown a marked thirst for knowledge, and there can be no doubt that the rapid improvement in the health of the people and the big decline in the infant mortality rate to 39.13 per 1,000 live births last year is mainly due to the work of the Women's Committees working as part of the Health Department organization.

Since the advent of Samoan district nurses some years ago working among the people, with the Women's Committees, and giving them repeated lectures on health subjects, there has been even more rapid advancement due to stimulation by a trained person of their own race who understands their language and customs. At present there are 267 Women's Committees in Western Samoa and 23 district nurses. The latter we are hoping to increase as more nurses become available.

There are also four nurses working full time in the bigger schools in Apia, carrying out treatments and giving health instruction to the school children.

The population of Western Samoa has doubled in the past twenty years, proving the value of the work of the Women's Committees. Although much remains to be done, the numbers and activities of these committees are growing every year, providing a bright augury for the future.

Sigatoka Agricultural Station

(Continued from page 10)

spp.), tapico (*Manihot utilissima*), kumala (*Ipomoea batatas*) and bele (*Hibiscus manihot*) are maintained. Plant material is not generally sold to the public with the exception of sprouted dwarf and hybrid coconuts.

The major part of the nursery is devoted to a collection of grasses and legumes and to their propagation. The collection consists of local grasses and legumes together with species and varieties that have been successfully established after importation through the Plant Introduction and Quarantine Station at Naduruloulou. Species that are promising are bulked up and tested in the field.

Small areas of different fruits and vegetables are also grown, and a small market garden is associated with the piggery.

(The second and concluding part of this article will appear in the July *Quarterly Bulletin*.—Editor.)

Education In Western Samoa

A detailed study of Western Samoa's education system was made in 1953 by Dr. C. E. Beeby, Director of Education for New Zealand. A review of his recently-published report appears below.

By C. G. R. McKAY*

THE Polynesians have been compared with the Highland Scots, or with similarly isolated and self-reliant communities the world over, where clan or kinship loyalties give satisfaction within the immediate circle, while complicating the solution of problems on the national scale. The Samoans, Tongans, and others of central Polynesia carry this resemblance still farther by a keen faith in the powers of education. They look to it to equip their children to meet the modern impacts upon them. In the broad sense these effects are widely apparent in increasing populations desiring higher standards of living, and a natural desire that they themselves be qualified in all forms of modern endeavour.

Western Samoa has some unique advantages—an indigenous population with a unitary society, speaking one language and almost fully literate in it. The social system is sometimes misunderstood: rank is enjoyed by many, in a patriarchal way. Chiefs and orators graduate by merit from the ranks which their own children still occupy; their authority rests on the consent of the governed. There is no problem caused by immigrant groups. Nor is there a public debt. The territory has been financially self-supporting for nearly 25 years except that New Zealand transfers to it *ex gratia* the profits (£100,000 in 1954) from properties in Western Samoa that New Zealand owns. A high level of prosperity is maintained by the present prices of copra and cocoa-beans, with a good export volume of both. There is an increasing social unity among the people. All these are factors that are encouraging rapid constitutional advances.

Dr. Beeby[1], a world figure in education, examined Western Samoa's schools system in 1945 and again in 1953. His more recent report gives observations of interest throughout the Pacific, and elsewhere. Comparing his two visits, he writes: "In the intervening eight years I have seen schools in many parts of the world and have, through Unesco, been associated with educational projects in a great number of underdeveloped areas, but I know of no country where more rapid general progress in education has been made than in Western Samoa. Admittedly there was wide room for progress . . . the system has still a very great distance to go, but it is moving rapidly . . . not only teachers but the general public are aware of the fact and show an obvious pride in what they are doing."

Let us see the framework of facts within this statement:

The local Legislative Assembly has four special committees, one of them devoted to education; on both of these bodies there is a majority of Samoan members.

Expenditure on education in 1952 was 14% of the total, and with additions from the profits of the New Zealand Estates amounted to 18%.

Samoa College, opened in 1953 (cost £88,000 plus proposed expansions £43,000) provides secondary education for pupils in their own country, though a primary department is maintained until the standard of English learned in the primary schools can reach that required for secondary entrance. The College has 153 acres of grounds, with terraced playing fields.

The local teachers' training college has been doubled in capacity and the course extended from 2 to 3 years. The number of pupils per teacher has been reduced from 44 to 33.

Certificated teachers have been increased from 9 (all from New Zealand) to 25 New Zealand and 5 Samoan. Primary school teachers from 224 to 354, and the salaries ranges for village teachers from £10-£60 to £100-£350.

The leaving standard of the village schools has been raised from the equivalent of Std. 2 (N.Z.) to Std. 4, with four district schools reaching Form II (Std. 6).

There is a schools broadcasting system integrated with the school programme "in a way that is believed to be unique in the world". Schools transmissions are an hour a day—not so much to teach the children as to guide the teachers how to teach. Broadcast lessons concentrate on health, social studies, nature study, singing, and spoken English.

A central library issues book parcels to village schools. There are locally prepared text books in the vernacular, a Samoan School Journal (provided from profits of the N.Z. Estates) and a teachers' monthly guide.

Village schools, formerly with all classes crowded in one single room *fale*, are being replaced by multiple room units of permanent materials; the pupils have stools or desks in place of twisting themselves into the contortions required in both sitting and writing on the floor.

Inspiring Results

Such are the cold statistics. Their results are inspiring. Formerly a partly-trained teacher drummed a hazy conception of learning into the pupils by parrot-like group drill and memorizing of sounds. Now, while the aims are still too formal and bookish, a level of understanding has been reached by the teachers that is translated into a widening comprehension by the pupils.

The final goal is still far off, and there are special problems, but Dr. Beeby does not include money among them so long as export prices continue high. Many territories will recognize these problems as their own, though influenced by varying extents of dependence on metropolitan funds.

Dr. Beeby is sure that stability requires some education for all, with accelerate classes and high opportunities for those capable of leadership, rather than to have leaders among an uneducated people.

On the language of instruction, his recommendations avoid discussion of political philosophies and merely testify that where the mother tongue is a vernacular a better command of a second language is obtained if school begins in the vernacular, rather than if pupils are confronted with a strange language from the first. This of course applies particularly where large numbers of teachers do not have a sufficient grasp of the introduced language to be able to teach in it.

In the village schools there is a slackening of enthusiasm as pupils approach the age where they become useful working members of the family. There are cases where the boys remaining at school are outnumbered many times by the girls, and even while still attending, the demands of home cause irregularity and lethargic response. The statement that village life offers little scope for adolescents to apply the benefits they have learned at school is perhaps rather sweeping, and does not allow for variations in personality and behaviour.

A central direction of set lessons and uniform patterns of work tends to stiffness and formalism, leaving little initia-

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* Mr. McKay is Senior Commissioner for New Zealand on the South Pacific Commission.

1 Dr. C. E. Beeby, M.A. (N.Z.), Ph.D. (Manchester), has been Director of Education for New Zealand since 1940. In 1948-49 he was Assistant Director-General of UNESCO. He was the leader of New Zealand delegations to UNESCO in 1946, 1947, and 1950, and in 1950 became an Honorary Counsellor of UNESCO.

Young Farmers' Clubs Of Fiji

MR. R. A. DERRICK, reporting on his 1950 survey of Vocational Training in the South Pacific, *said:*

"There is general agreement that, in rural areas, education at primary and secondary levels should have an agricultural bias, but there is no general agreement upon how such a bias is to be applied, and in some areas it remains too tenuous to be effective. The most promising solution observed during this survey is represented by the Young Farmers' Clubs of Fiji. These are being established in rural schools, along lines developed in the United States and the United Kingdom."

In the following article, the officer in charge of the Young Farmers' Club work in Fiji schools describes how the movement has developed since 1950.

Fijians taking notes at a Young Farmers' Club field day at the Principal Agricultural Station, Koronivia. The display is of Y.F.C. projects at various schools in Viti Levu.

By R. L. HARTLEY

Agricultural Education Officer,
Education Department, Fiji

IN Fiji, the Young Farmers' Club movement is at present confined to school clubs, covering an age range from 10 to 14 years. Progress has been good, and in due course senior clubs may be established for ages of from 15 to 21 or 25 years.

The specialist agricultural staff of the Education Department, which administers the school clubs, consists of one European Agricultural Education Officer and two Agricultural Organizing Teachers (one Fijian and one Indian).

It was not until 1950 that really active development work commenced. Before this a survey carried out at schools throughout the many widely-scattered islands of Fiji showed that only two schools had a semblance of a properly organized Y.F.C., while school gardens were in the main poor or non-existent. Usually, the gardens were odd patches of unweeded taro, cassava, or sweet potatoes, surrounded by waste land, scrub, or bush. Lack of fences or hedges and too few gardening tools were the rule rather than the exception. It was therefore clear that the development of Young Farmers' Clubs and of school gardens should go hand in hand, starting from scratch.

Today, there are over 400 registered schools, and approximately 100 have efficient clubs with either average, good or excellent school gardens. Another 150 are carrying out active Y.F.C. project work with similar gardens but have yet to master the efficient conduct of Y.F.C. business meetings; 150 are still generally poor, and if they purport to have a Y.F.C., it exists in name only. Although the gardens of the last group are unworthy of the name of school gardens, at least most of them show some slight improvements over their former condition.

The best school gardens are excellent examples of efficient land utilization in their districts, and there are many examples of local farmers emulating what they have seen demonstrated such as soil conservation methods, improved diet through more varied cropping, etc. For instance, quite recently a Fijian school Y.F.C. in one of the more remote areas included Chinese cabbage as one of its several cropping projects. It was the first time it had been grown in that particular locality. The school obtained £15 from the sale of this crop alone, and a local Fijian farmer, noting this, followed suit and made £200.

With existing staff, many schools cannot be visited by the specialist staff more than once in two or even three years, and without more frequent supervision the work of many deteriorate. When visits are made an inspection form is completed. The results are converted into various gradings of efficiency which are shown by coloured discs on a map maintained at headquarters. Between visits adjustments are based on brief monthly progress reports sent in by all schools. These are of course subject to inaccuracies, but help is also given by non-specialist visiting staff of the Education Department.

Development work is based upon the need to improve school gardens, making the fullest educational use of them, and to implement the aims of a school Y.F.C. It must be emphasized that the aim is not the mass production of potential future farmers or farm workers. The work is planned to be an integral part of the rural science curriculum and of practical gardening, but with additional after-school activities, being at the same time closely correlated with other subjects of the school curriculum such as English, writing, arithmetic, social studies, art and craft, etc., thus giving a rural bias to the whole curriculum. In each case definite interests are harnessed, and through the Y.F.C. a competitive spirit is engendered. Training includes the development of co-operative work, leadership and thrift.

An efficient Y.F.C. enhances general education, yet inculcates a love of the land and provides simple yet basic agricultural training at an early age, to the benefit of the majority of pupils entering the agricultural industry on leaving school. Almost invariably, the best schools in agricultural work are the best

The Fijian agricultural organizing teacher judging a Y.F.C. Group project at a Fijian school, before the Nadroga District Field Contest. At his request the student is searching for pests that have damaged his Chinese cabbage. Later the examiner will cross-question him about the pest—its life cycle, means of control, and so on. All questions are put first in English, and then if necessary are repeated in the vernacular.

in all subjects, and this is reflected in public examination results.

To implement these aims in a country such as Fiji is difficult, and one must be prepared to meet many disappointments. These can be reduced, however, if pains are taken to understand the psychology of the people concerned, an obvious need which is so often ignored.

Every year, teachers' courses are held at "model" schools at strategic centres, at which both theory and practice are demonstrated. Early courses dealt exclusively with correct procedure in establishing school Y.F. Clubs, general organization and conduct of project work, and preparation for annual field contests at the school and district level, the former serving as heats (as in sports) for the latter. Later ones have been devoted partly to general matters of organization and effective correlation work with selected teachers participating, and partly to the provision of direct technical agricultural instruction by specialist officers of the Department of Agriculture, Forestry, etc. Inevitable local problems are dealt with "on the spot".

Periodic information is given through the medium of the local Education Gazette and a series of instructional posters on the general theme, right and wrong methods of basic agriculture, are being steadily built up. From the beginning, a photographic record has been maintained. Much of this material is included in three manuscripts on "Agriculture in Schools" recently prepared for publication, which are at present being examined by the South Pacific Literature Bureau.

A model programme incorporating contests, demonstrations, sports, Fijian and Indian entertainments (by Y.F.C. members) was prepared one year in advance and implemented for the first time in 1951 at two Viti Levu centres: Sigatoka and Nausori. The Directors of Agriculture and Education both paid tribute to the success of these two district contests, which were the first fruits of extensive preparatory work.

The demonstrations were valuable to both children and adults. They included:

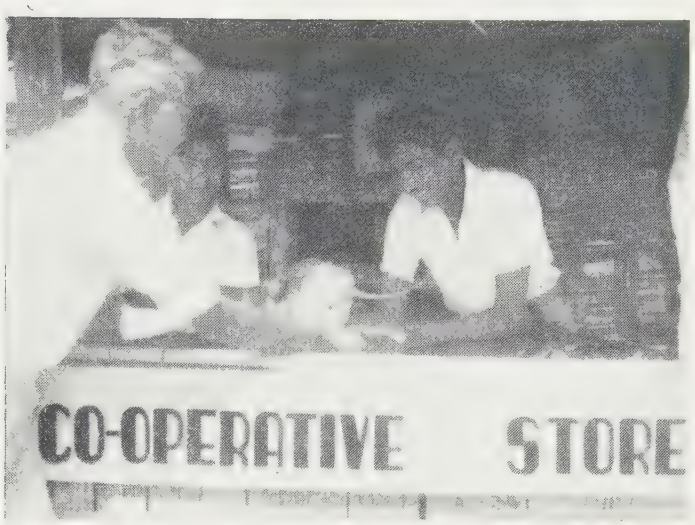
1.—agricultural education in schools (including exhibition material lent by the Forestry Department);
2.—film display on soil conservation, Y.F.C., with locally adapted commentary, etc.;
3.—weeds and weed control;
4.—beneficial and harmful insects;
5.—plant diseases;
6.—animal diseases;
7.—useful grasses and legumes;
8.—desirable type of milking cow;
9.—garden tools and equipment; and
10.—food hygiene at home and food for school children.

Nos. 1 and 2 were conducted by the Education Department, nos. 3 to 8 by the Agriculture Department, no. 9 by a local firm, and no. 10 by the Medical Department, with the Dietitian, South Pacific Health Service, in charge. The Public Works Department, the Police, local radio firm and haulage contractors all assisted with general arrangements, and have done so ever since. The Colonial Sugar Refining Company, in particular, have played a prominent part from the beginning in assisting the Y.F.C. movement, and in their mill districts they provide transport, valuable prizes and general assistance from their staff.

District Y.F.C. Contests are now organized every year at Nausori, Sigatoka and Lautoka on Viti Levu, Labasa on Vanua Levu and Levuka on Ovalau. All have their own committees advised by the Agricultural Education Officer and, as distinct from overseas practice at the district level, the organizing secretaries are unpaid. A new committee was established this year for the Navua District of Viti Levu. At the Nausori Centre this year 35 schools competed, and there was an estimated attendance of 2,500 children and adults. The most advanced centres are Sigatoka and Nausori, both of which have now established District Federations with far-reaching aims. There is a maximum of 100 marks for each contest, 50 of which are allocated for inspection work carried out before the contest date, and the remainder allocated on the actual date. All is subject to a prescribed marking system. Prior inspection and questioning of members on their project work and marking is undertaken by the specialist agricultural staff, a very considerable task, but on the contest date other judges assist and are drawn mainly from

Boys at this nearby Indian school are standing, records in hand, awaiting the Indian agricultural organizing teacher, who is in the background about to commence judging. Plot markers are made by the boys from old tins. Pupils of Fijian schools near the coast use clam shells instead.

CATION



Many Fijian and Indian schools now have Y.F.C. co-operative stores. This one at an Indian school in the sugar-cane district supplies many one-crop farmers with their basic food needs, saving them a journey to the nearest market 17 miles away. Articles made in art and craft classes are also sold. Children keep the records, supervised by teachers. They work according to a duty roster before or after school hours.

the Department of Agriculture, while competent local citizens also assist.

The official 1954 programmes included the contests listed in the table below.

Competitors enter for seven contests for the challenge shield, asterisked classes being compulsory. Certificates of Merit (1st, 2nd and 3rd Class) are awarded for each class. The detailed marking system and conditions of entry (which includes records) for each class are designed to implement the aims of a school Y.F.C. already described.

CLASS	*REMARKS*
*1. Best School Garden	Marked before the date of the District Contest. For all the other classes, half of the total marks are allocated before, and the balance on, the Contest date.
*2. Vegetables	Includes a list of clearly defined leafs, root, cereal, and legume crops.
3. Fruits	Includes local "Veimama" bananas, pawpaws, etc.
4. Nursery produce	Seedlings of food, ornamental and forestry plants of specified age.
5. Compost	3 lb. samples in tins of specified size. Records inspected, etc.
*6. Poultry	Pullets under 4 months old raised from settings of eggs.
*7. Agricultural General Knowledge Test	Recognition of 20 displayed articles—soils, manures, crops, weeds, pests, livestock, foodstuffs, tools, etc.
8. Art and Craft	Models of copra driers, rice mills, livestock housing, soil conservation methods; poster work connected with agriculture, string making, etc.
9. Public Speaking Contest	5-minute speeches on agricultural subjects and answering questions thereon.
10. Flower arrangement	Flowers from school gardens only—vases made from bush materials (tree ferns, bamboo, etc.).
11. Homecraft	Preserves from school garden produce, etc.

Education In Western Samoa

(Continued from page 24)

tive and freedom to the teacher, but these are accepted as necessary evils until knowledge of teaching methods improves.

Underlying all problems is the desire of the people to hold to their traditional ways of living and yet to meet the inevitable effects of world contacts. Dr. Beeby sees education as the catalyst best able to accommodate these forces without disruption, by creating a mental climate able to evaluate equally and objectively both the new and the old. He puts a keen question applicable to many of the Pacific territories where development is at a critical stage, and economies are supported only by high prices rather than by increasing volume of output: "Whether it would be wise to spend heavily on education now, in preparation for a period of lower prices when national income can be maintained only by increased production?"

Dr. Beeby's main recommendations have a wider interest than for Western Samoa alone:—

1. Compulsory education to be applied, progressively in time and district by district—this involving registration of Mission schools whose quality and standards vary widely.

2. Teacher training to be accelerated further; Samoa College to become fully secondary as soon as the standard of entrants permits, and with a boarding establishment. Courses to be academic, commercial, and general, with no technical or agricultural courses apart from manual training as part of every course. The small numbers who will go on to University Entrance to study for it in New Zealand. The practice of pupils growing their own food at boarding establishments is condemned as a routine drudgery and as teaching little.

3. Scholarships in New Zealand, which the N.Z. Government has provided *in loco parentis* for over 100 pupils from its Island territories since 1945, were initiated to meet the demand for qualified Islands people at the earliest possible moment. The system was a calculated risk, with school records in New Zealand particularly successful, losses less than expected, but with some evidence of restlessness when the pupils return home. (One may paraphrase another authority and admit that rapid social progress is impossible without individual strains.) Dr. Beeby recommends that the system be continued, but that as Samoa College becomes effective the scholarships be transferred from the primary and early secondary stages to University stage on the one hand and to technical and trade training on the other.

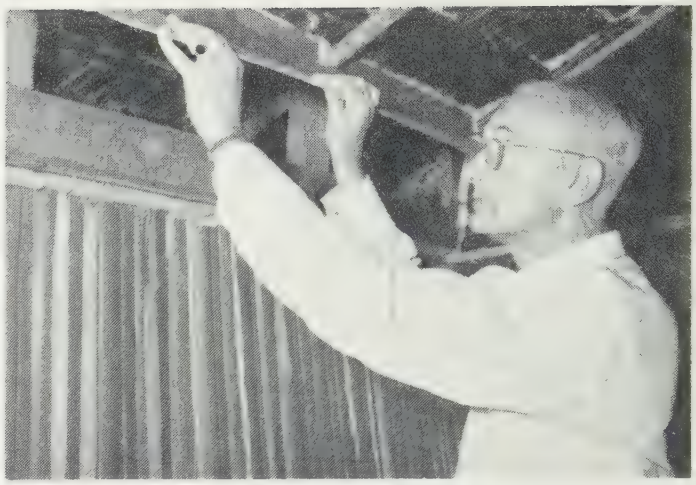
4. Adult education, of which there is little in Samoa apart from vigorous health organizations, and where community development would find little scope among such a closely knit society, is nevertheless regarded as urgently necessary for young men after school leaving age, and as the effective channel for training in agriculture and co-operatives. Linked with this are needs for a good general library and a good bookshop.

5. It is disappointing that technical education is not dealt with in the report, because there was not time to make the study it requires, and because consideration of it is involved with proposals for a central institution in Fiji. Dr. F. J. Harlow's recommendations of February, 1953, have been in the hands of the Governments interested—it is expected that a discussion between their representatives will take place during the first half of 1955. Dr. Beeby stresses the importance of vocational training in his comment that "the underdeveloped countries of the world already provide too many examples of purely academic schools that have unfitted their pupils for life in their own countries."

Such is a review that is rather long but is still fragmentary, because Dr. Beeby wastes no words and his every sentence is of force and interest.

N.Z. *Department of Island Territories.* Report on education in Western Samoa, by C. E. Beeby. Wellington, Govt. Printer, 1954. 40 p. 1s. 6d. (plus postage)

One of the three native-style houses built for the experiment near Hollandia.



Professor van Thiel adjusting a movable flap below the eaves.

Malaria Control By Insecticide Spraying

By P. H. VAN THIEL

Professor of Parasitology, Institute of Tropical Medicine, Leyden University, The Netherlands.

This article gives brief details of a pilot project being carried out in Netherlands New Guinea to control, by residual insecticide spraying, malaria transmitted by the anopheles punctulatus *group of mosquitoes.*

"NECESSITY is the mother of invention", but a Dutch adage also says —"Whoever is not strong has to be clever".

This proverb holds good in human relations as well as in those between man and the malaria mosquito. The latter displays a tremendous slyness in getting its meal of blood; it is hardly possible to imagine greater cunning than mosquitoes of the *Anopheles punctulatus* group possess. The *Anopheles punctulatus, farauti, koliensis, clowi* are responsible for the transmission of malaria in the territories covered by the South Pacific Commission.

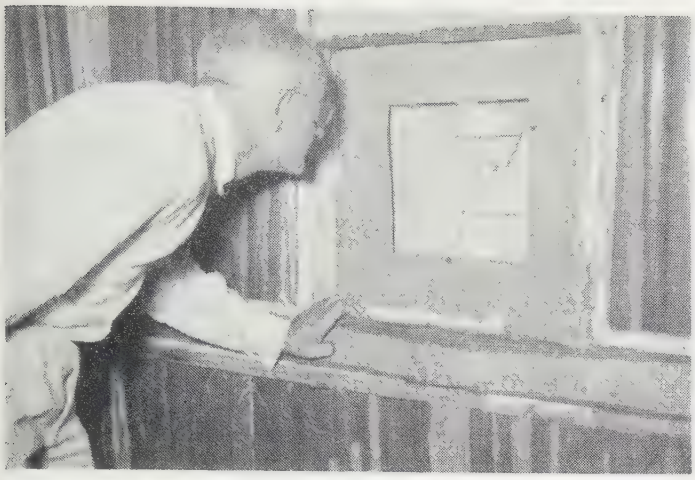
Almost everywhere in the world it has been found possible to control malaria by covering the inside walls of houses with a thin layer of DDT, a residual insecticide. The Anopheles, alighting on such walls and remaining there for some time, die from bodily contact with the insecticide. However, in the case of *Anopheles punctulatus,* it was thought that, although it flew into dwellings to feed on man during the evening and night, it left the house immediately after feeding and did not rest on the walls, so that residual spraying with DDT would therefore not be a satisfactory method for killing this mosquito.

Nevertheless, it was considered it might be possible to get the better of the *Anopheles punctulatus* group of mosquitoes in this respect. Accordingly, in collaboration with Dr. D. Metselaar, the Head of the Malaria Control Service in Netherlands New Guinea, I made an attempt.

Three houses which were identical to each other in every respect were constructed near Hollandia, Netherlands New Guinea. Built on piles, they were of the same type as the native houses in the area, and were made of the same materials. The eastern wall of each house was provided with two windows, which could be closed by a cage functioning as a trap. These cages could be placed during the night and removed at dawn. The eaves could be strapped up by a shutter arrangement; the floor was covered by sheets of cardboard, so that the interstices between planks were closed. A dark cloth hung behind the door inside the house prevented the mosquitoes from entering and leaving the house when the door had to be opened. A "bait" was provided by native boys, one in each house, who spent the evening and night therein.

In one of the houses observations were made on the behaviour of mosquitoes after they had entered in the house. We found that 87.7% of the 1,607 specimens which had entered the house were caught in the traps when they tried to leave, 93.9% of those having fed on the boy. The mosquitoes showed a marked tendency to leave the house at dawn, mainly when the night had been dark and moonless. This meant that the mosquitoes were inclined to remain indoors for a longer period during the night than was thought before; they could regularly be observed resting on the walls after being satiated. This fact allowed for a favourable prognosis as regards their control by insecticide residual spraying. The best change for a lethal contact with the insecticide concerned those which were recoverable in a replete and resting state on the walls in the morning (12.3% of the mosquitoes which had entered the house).

It was also found that only 20% of the mosquitoes entering a house attempted to leave during the time when the eaves were still open. These mosquitoes might possibly have had too short a contact with the insecticide to absorb a lethal dose, should the house have been sprayed with the insecticide. It was also



The author examining an exit trap inside one of the houses.

Two of the exit traps mounted on an outside wall.

observed that *Anopheles karwari* behaved very much in the same way as the mosquitoes of the *Anopheles punctulatus* group did.

The experiments could not be conducted on a larger scale because a long period of drought such as seldom occurs in this part of the world, was responsible for a decreased mosquito population.

We were nevertheless successful in showing that mosquitoes of the *Anopheles punctulatus* group rest on house walls oftener and for longer periods than we had previously supported. Armed with this knowledge we investigated the possibility of killing these mosquitoes by the use of residual insecticide sprays.

When the anopheline population was thought to be sufficient, the inside walls, roof, door and doorcloth of house No. 1 were sprayed with a suspension of 5% DDT water-dispersible powder at the rate of 2 g. per square metre, while house No. 2 received a spray of 1.25% dieldrin emulsion at the rate of 500 mg. per square metre. House No. 3 was left unsprayed and served for control purposes.

The following results were obtained during the period from 9th February, 1954 (the date of spraying) to 21st March, 1954. On the later date the author had to leave Netherlands New Guinea, but the observations were to be continued.

House No. 1, sprayed with DDT. On the mornings after the eaves had been left open for the entire evening and night, an average of 66% of the 502 anophelines were found dead on a sheet spread on the floor, while 13.5% were found dead in the traps. Of the mosquitoes caught in the cages, another 13.5% had died after 12 to 24 hours through contact with the insecticide. Of all the mosquitoes which had entered the house only 6% had no contact or insufficient contact with DDT.

House No. 2, sprayed with dieldrin. On the mornings after the eaves had been left open for the entire evening and night, an average of 61% of the 181 anophelines were found dead on the sheet spread on the floor and 35% in the cages. Only 4% were still alive in the cages and all these died within 12 hours. Dieldrin, at the dosage used, had therefore a more toxic effect on anophelines than DDT had.

When eaves and windows had been kept open during the entire evening and night, anophelines were also found dead on the floor on the following mornings, in both the DDT and dieldrin sprayed houses.

In order to know whether the favourable results of the reported experiments could be of value in malaria control work, we have proceeded with the DDT spraying of houses of the villages near Lake Sentani.

A close collaboration concerning their respective pilot projects has been planned between the Malaria Control Services or Netherlands and Australian New Guinea.

Extensive Coconut Plantings In Lae Area

DURING the past six months native communities within a 40-mile radius of Lae have planted 35,400 coconuts, and it is expected this figure will be doubled by June. The population of these communities totals about 8,000. This is part of a plan by the Morobe District Services staff in collaboration with the Agricultural Department to promote native economic development. The coconut groves are set out under the supervision of District Services officers. The long range aim is to interplant with cocoa in areas where the soil is suitable when the palms are eight to ten feet high.

The groves are being planted with selected nuts obtained from the Administration's Baibara Plantation at Orangerie Bay, and also from the Markham Valley and Tufi. The Baibara nuts are the San Ramon type imported into the territory pre-war by the Papuan Administration to improve coconut yields, and have an output of up to 10 ounces of meat per nut compared with the general average of five to seven. Markham Valley coconuts are also of a special type, being big, high-yielding nuts which were introduced into the territory many years ago, probably by the German Administration, and traded back from the coast to the Markham Valley by the natives.

A similar coconut planting programme has been initiated in the Finschafen area, where native communities have established new groves containing 25,000 seed nuts during the past nine months.

In addition to the planting programme villagers have been encouraged to clear and work existing groves which have become heavily overgrown, and where the only nuts used were the few required for food. In areas where clearing of mature groves has been undertaken it is not uncommon for a village of about 150 people to collect £75 for their month's output of copra.

Work will start soon on a similar coconut planting programme in the Kaiapit Sub-District at the head of the Markham Valley, eighty miles northwest of Lae. Existing mature groves will be cleared and worked, and it is estimated that 100 tons of copra can be obtained immediately, returning a monetary yield of approximately £7,500. The population of the Kaiapit Sub-District is 14,000.

Last year natives of the Finschafen Sub-District produced 12 tons of coffee, and are being encouraged to improve and extend their coffee plots as a source of cash income. Coffee production in this area was initiated before the war by the Lutheran Mission. A start has also been made on coffee planting in the Wain Sub-District.

Health Education of the Public

Sidelights on a seminar on health education held in Canberra last January are given below . . .

By GUY LOISON*

FROM January 11-21, 1955, forty-four persons met at Canberra to discuss health education.

The organizers of this seminar should be doubly congratulated: firstly because it was the first time that such a gathering had been held in Australia on a national scale; secondly, because it was a success.

The world press has given accounts of the main phases of the seminar. The official conclusions will appear in a report which will not be published for several weeks. Here, therefore, I shall merely pass on a few personal impressions to readers of the *Quarterly Bulletin,* at the same time attempting to discover the reasons for the success of this conference.

The first is an intrinsic reason: almost all the delegates were people who, in their daily work, encounter problems which could not be solved without the aid of health education. They had come to Canberra to learn from the experience of others and not to make pompous statements. After ten days spent in exchanging ideas they returned home with new knowledge and increased enthusiasm. The first results of the seminar will thus have been to give fresh impetus to health education in general within the states and territories of origin of the various delegates (Australia, New Zealand, Papua and New Guinea, etc.).

The delegates—and this is the second reason for success—represented various fields of interest, a due balance of numbers being preserved as between each field.

Doctors numbered fourteen. In their districts, some were responsible for public health, others were school doctors; some were specialists, and yet others general practitioners. To these should be added a dentist, two health inspectors, three nurses and two nutritionists.

It must be admitted that at the end of discussion, the last word often remained with a country doctor who knew how to draw wise conclusions since he considered problems from a practical and human angle. Indeed, in matters of health education, as in many applied sciences, knowledge of mankind is essential. Although the head of a health department might possess all the data necessary for assessing the needs of a population, the family doctor is better placed to understand the innermost motives which will ensure the effectiveness of an educational campaign in a community.

One of the four discussion groups at the seminar. Left to right: Dr. E. M. Durie, Dr. E. Clement, Mr. G. W. Slough, Dr. C. Jungfer, Mr. J. D. Mabbett, Miss J. Howeler, Dr. G. Loison, Miss M. Godfrey, Professor F. Duras, Dr. D. J. R. Snow, Mr. P. Pentony, Miss H. Martikainen.

Lengthy discussions took place concerning these motives. If no appeal is made to self-interest, is it not pointless to undertake an arduous and expensive campaign? The various forms of self-interest to satisfy or even create in the different age and social or racial groups had therefore to be considered. Accordingly, the sociologists (of whom two were present) and the psychologists (also two in number) were called upon. To eat, to love, to receive marks of esteem from one's fellow citizens, not to die too soon; these are generally the main human preoccupations. It should seem logical to consider good physical and mental health as an essential factor in attaining these ideals. But physical and mental health can equally well be as much an essential basis for attainment of the ideal as the end result. Unfortunately, however, health is often the least care of those people who have decided to profit to the utmost from the material satisfactions of life.

In each case health education implies a number of changes in attitude and behaviour which it is very difficult to make people accept. To educate and at the same time to inform, appears less difficult; but to overcome passive resistance, or even worse, actual hostility, is only too often the first task of the health educator. Obviously there is no point in using fear or punishment which are, in any case, justified only on infrequent occasions. I often tell the following story: After a long absence I returned one day to a Pacific island where the people organized a magnificent fishing party in my honour. Enormous quantities of writhing, multi-coloured fish, reputed to be delicious, soon piled up on the beach. As meal time approached I was openly expressing my delight at the thought of the fresh health-giving food which awaited me, when the village chief interrupted me to say: "For you, Doctor, we have something better!" and he ordered a tin of sardines to be opened.

The motivation is clear. The innate politeness of the islanders, on the one hand; pride, on the other hand, at displaying wealth and proving that what is believed to be European culture has been well and truly assimilated. The money obtained from sale of crops is largely used for buying polished rice, white flour, tinned meat, and also sweets and alcohol. The ancestral diet, to which these people were perfectly adapted, is changing gradually along with the evolu-

* Dr. Guy Loison, who is a member of the French Colonial Medical Corps, is Research Officer for Health to the South Pacific Commission.

tion in agricultural techniques and social customs. Whatever the method proposed to remedy the consequences of these changes, which are so harmful to health, it will first be necessary to educate the people.

The doctors who met at Canberra expressed the wish that control of health education remain in the hands of the medical profession. But on considering the anecdote recounted above—which is a common experience—one can understand that educators will have to be recruited from amongst a wide variety of professions. In fact, the only persons who come into contact with the islanders in their villages are, in most cases, the administrator, the doctor, the missionary, the schoolteacher, the nurse, and the policeman. In certain of the more highly-developed islands there are also women's committees and charitable societies.

In my opinion it would be a lack of methods and work programmes rather than educators, whose intentions are admittedly good but whose theories and aims on the other hand are so different that they might create confusion in the minds of the people. Participants in the seminar discussed the motives which encouraged people to seek to improve their knowledge. Less has been said about the motives of those who wish to teach. In the islands one comes across so many prophets, philosophers, sectarians or merely *dilettanti* all wishing to found schools, that if care is not taken the greatest possible disorder is bound to occur in the field of health education. It is not until a programme has been established, keeping in mind the aim to be attained, that the assistance of the best suited educators should be sought.

The Committee of Experts of the World Health Organization even goes as far as advising, in certain circumstances, recourse to the help of witch doctors. Naturally, it must first be ascertained whether such co-operation is desirable. Is our purpose the same? I have only too often been at cross purposes with these dispensers of fatal remedies to expect a great deal from their counsels.

In the South Pacific territories there already exist native doctors, nurses and midwives who seem to me to be the obvious propagators of the good word. Health education should be part of their curriculum.

During the seminar, several of those present called to mind the problems set by the aborigines on the Australian continent. Problems affecting the territories of Papua and New Guinea were outlined by Dr. J. J. Refshauge (Maternal and Child Welfare). I was called upon to describe the situation confronting us in the South Pacific as a whole.

One evening during the course of my stay in Canberra, Dr. F. W. Clements (whose varied work in New Guinea will be remembered), Miss M. McLachlan (Officer-in-Charge, Female Education Division, Port Moresby) and I, took part in a discussion on the subject of health education in the Pacific area, which was broadcast by the Australian Broadcasting Commission. Miss McLachlan is well known to us, having attended the Second South Pacific Conference in Nouméa as Adviser to the delegations from Papua and New Guinea. One of the conclusions reached at this conference was worded thus:

> "The boarding school affords the best opportunity for the health education of boys and of girls. The boarding school can be organized so that hygiene becomes an integral part of daily life and students returning home carry back with them a knowledge of organizing hygiene and hygiene habits."

Miss McLachlan, in common with her colleagues in public education, had ample scope at Canberra to talk on the part to be played by the teaching profession in health education. The teachers, eight in number (plus three physical training teachers), arrived at the conclusion that their profession is of prime and vital importance in this field. School and university curricula, sports, school canteens, dental caries, and immunization were inexhaustible subjects.

Subjects for Discussion

At the first meeting, members drew up a long list of possible subjects; then they decided on those questions which should be discussed at the seminar. Thereafter, the scope of each main topic included in the agenda was outlined by the participant in the seminar most qualified to speak on it. Delegates were divided into four groups for discussion, care being taken to give equal representation to the various fields. Each delegate in turn took over the chairmanship of his group. A summary of the debate and conclusions reached were then presented in plenary session by elected spokesmen. Then followed general discussion. The excellent organization of the seminar seems to me to be the third reason for its success.

A volume would be required to review the work done in these ten days. While awaiting publication of the final conclusions, I prefer to leave readers to reflect at leisure on a few of the items which occur to me. For instance: "Groups most likely to be influenced by health education?" The young child won most votes. The home environment seems to be the most favourable for inculcating good habits. If, in certain situations it is not, then the kindergarten or the infant school have an important role to play. But how many cases exist in which school and family influence are at variance? Co-ordination and a common effort are essential. I call to mind here the interesting work done in France by the "Parents' School", an association which seeks to resolve such conflict.

As far as influencing adults is concerned, I remember having expressed some doubt. One has only to take the example of the way in which some patients follow the advice of their doctor when it is contrary to their tastes, or merely even to their habits. Does a poster prevent a drunkard from drinking, or a reckless driver from travelling at 70 miles per hour? In fact, ignorance is the least obstacle the educator is liable to encounter.

To obtain the best results, we were told repeatedly: "Go to the people; let them themselves indicate their immediate needs; establish your programme together; talk 'with them' and not 'at them'; forget your vanity; reduce social distances."

Under these conditions, it is not sufficient merely to wish to become an educator; one must have the vocation and also (why not?) the right physical make-up for the job. Above all, it is necessary to know the people one wishes to speak to, so that one can adjust one's approach accordingly and employ the most appropriate methods.

I remember in one territory receiving a collection of filmstrips from Europe intended for instructing islanders. I glanced at one of them on tuberculosis control. One picture was intended to demonstrate the tonic and beneficial action of sea-water. It showed two Europeans of the 1900's (boater, celluloid collar, bushy moustaches) walking carefully along the beach and holding their trouser legs up to their knees. Try to imagine the reaction of South Sea islanders to this odd spectacle. And as for the results of this picture on the problem of tuberculosis!

Educational material should be developed and used locally. I showed the members of the seminar the Commission's filmstrip on the use of soap, merely made up of drawings depicting Melanesian people; I also showed my favourite filmstrip, which is made of photographs taken in a Caledonian tribe. This type of film is more likely to be effective; unfortunately its use is very limited geographically. However, in all the territories there are amateur photographers, and there is, therefore, no reason why such material should not be produced on the spot rather than sending for European material, which it is not always possible to use to advantage under local conditions.

To return to the discussions, one of the most striking examples of the urgency of health education was given us in the course of meetings devoted to accident prevention. It was already a known fact that the most common cause of death amongst children from 10 to 15 years is drowning. Dr. Snow (Perth) presented the general mortality statistics in terms of "useful years lost" rather than according to the number of deaths. It was thus seen that "car accidents" and

"other accidents" took first place ahead of myocarditis.

Amongst other subjects studied, let us also mention that of mental health under the stress of the present age; handling of foodstuffs (the municipality of Rockdale, N.S.W., which has started a course for all professions concerned, was given as an example); and sex education (I hope to obtain permission from Professor F. Duras of Melbourne to publish the text of his admirable talk in the *Bulletin*). By reversing the native social organization, introducing new religious prohibitions, and modifying housing, clothing and education in the Pacific islands, is white civilization not guilty of creating psycho-sexual problems? If this is so, has anything been done to prevent the pathological consequences? Is it not shameful hypocrisy to try to ignore them? These are merely questions I ask.

The main headings of health education: methods, assessment of results, recruitment and training of personnel, were, as one might expect, debated at length. Two representatives from the World Health Organization were obviously the best qualified to give advice: Miss H. Martikainen, Head of Health Education in Geneva, and Mr. L. Keyes, Adviser to Manila Regional Bureau (it will be remembered that the latter was present at the Second South Pacific Conference in Nouméa and has already contributed to the *Quarterly Bulletin*).

Mr. Keyes announced that a seminar on health education in South East Asia and the Western Pacific is to be held in Manila in mid-October, 1955. The geographic area concerned and the multifarious problems involved suggest that the task will be a big one. In this respect I remember having expressed the wish at Canberra that seminars of this kind be organized frequently with only one main item on the agenda.

A most important aspect is, in my opinion, the training of specialists in health education. Few countries can claim to have produced any. It was considered sending grant-aided students (but which?) to European and American Universities which offer the necessary courses. It is to be hoped that one day such courses might be given at a University closer to the area with which we are concerned, or that, at least, countries possessing well-organized Departments of Health Education might instruct and train personnel from South Pacific territories. For instance, I have in mind the Health Departments of the States of Victoria, New South Wales and Queensland, all of which had sent their publicity officers to the Canberra seminar.

After the seminar I had the opportunity of visiting the Departments at Sydney and Brisbane and admiring their excellent organization. In Queensland, for instance, the Government has appointed a Council which includes representatives of the State Departments of Health and of Public Instruction, the Red Cross, women's associations, etc. The Council has appointed four standing committees from within its membership —medical, development, financial, and publicity. Through the secretary of the Council, who is an officer of the Health Department, continual contact is maintained, ensuring close co-operation in the Department's general policy. Under the direction of the publicity manager, a technical office (editors, artists, film technicians, lecturers) deals with the collection, preparation and utilization of the material best suited according to time and place.

In Conclusion

To conclude these few reflections on the Canberra seminar I shall add a fourth and last reason for its success: comfort. Material comfort due to the pleasant climate, picturesque site, and attractive quarters at University House; mental comfort, thanks to the cheerful attitude of both delegates and staff (congratulations to Miss K. Gordon in passing).

When one has experienced the enthusiasm which existed amongst all these people and been made aware of the faith in health education which inspires the university professor as well as the health inspector; the factory nurse as well as the principal of a woman's college alike—one can be certain that despite the obstacles which are bound to occur, a big step will be accomplished towards improving the physical, mental and social welfare of the Australian people.

Despite our backwardness and the vastness of our oceans, may the beneficial repercussions of this effort reach the shores of our islands.

Agricultural Production For Cash

In this letter to the Editor, Mr. W. E. Tomasetti discusses some of the basic social and economic problems involved in the development of cash crop production among people accustomed to subsistence agriculture. It is hoped that other readers will give their views on this interesting and important subject.

Sir,

I have read the article "Roads, Rice and Rural Progress" by Mr. R. N. Hancock in the October, 1954, issue of your *Bulletin* with some interest as I have been administratively involved for several years in schemes, the purpose of which is to foster native cash agricultural production, more recently with rice as one of the major crops.

I believe the time has come when a comparison should be made of the various schemes in the Territory (the Territory of Papua and New Guinea) by which native cash agricultural production is being assisted, with the aim of attempting to distil out of them some principles which may be of topical interest.

I am disappointed that Mr. Hancock did not deal with what is surely a major consideration in these ventures—the relationship between cash demand in a community and its cash economic development: this becomes of particular interest when the question of mechanization is introduction. In illustration, it is clear that a Territorial people still exclusively preoccupied with subsistence and a fringe of trade will not be interested in cash economics: a more developed people will only turn to cash agriculture when they have become dissatisfied with the rewards and by-products of migrant labour. If a group is talked into cash agriculture at this stage there is a danger that the institutions introduced will be perverted to give other satisfactions. This happened to a non-Administration venture in the Northern District in 1948-49 when cash agricultural production degenerated into what was substantially a gardening cult. At a further stage of development, mechanization of agriculture only becomes economically meaningful when the cash demand of the people involved has reached the level where it cannot adequately be met by hand labour organized on the inefficient traditional basis. Machinery cults are also a potential danger. The suitability (from all aspects) of the crop introduced and the relation of the income therefrom to the income from other current sources must also be considered if the scheme is to be properly based. Of course it is not always possible to wait for certainties, but if risks in this regard are to be taken they should be first identified as risks.

I feel that Mr. Hancock does not do justice to the case for individual against communal production. The crucial point here, in my view, is whether a traditional or a non-traditional unit of production is being used and I feel a unit of production larger than a clan is a rarity in the Territory. I believe that recent experience in the Mekeo Project indicates quite firmly that people will much more readily adopt a traditional unit of production than they will adopt one which has no traditional familiarity. This is not surprising. The second mentioned has the danger of being dependent on 'bosses' and may speedily degenerate into a gang system. If a field is worked by a large

non-traditional unit there may emerge a tendency (perhaps for prestige reasons) to replace the participants with migrant labour. This could not be considered a healthy social development whatever the economics of it were.

There are some positive social advantages in trying to keep production based on a small traditional unit. Everybody can guess at the intense satisfaction a native gets out of growing crops in an area he can and does regard as his own. This satisfaction would evaporate in the communal system. It is not unlikely that any economic ties that can be added to the others uniting families will be useful in preserving such families through a period when native society is being subjected to very strong pressures which are producing deep changes in most aspects of daily life. In the Mekeo Project fields worked by simple and extended families have successfully produced rice by both mechanical and manual cultivation which indicates that the smaller unit is not a fatal objection to mechanization given suitable terrain.

However, although I feel a small traditional unit is the most satisfactory basis for production, it is clearly unsuitable as a basis for a society organized under the Native Economic Development Ordinance. Ideally, I believe, such a society should function (in relation to production) as a processing and marketing agent. It is also possible to see it, as its capital increases, as a hirer of agricultural machinery to producers. A corollary of most schemes is for the society to commence retail trading, the advantages of which in convenience, prestige and the enhancing of the cash demand, are obvious.

In practice the unit on which a society is based is generally the village, and this normally will give an economically and socially viable unit. Where villages are small (say, under two hundred) and close together they could be united to form a society. The grouping of various societies into an association is a later logical development which rationalises many of the business activities of the body.

In summary, recent experience in the Mekeo Project has tended to prove that the best chance of success in this field results from basing production on a small traditional unit and restricting the society to the functions outlined above. A society based on a village should enter the field of production only when the village is a traditional unit of agricultural production.

If it is to be successful the results of any scheme of native cash agricultural production must give the participants the right mixture of social and economic satisfactions.

Yours, etc., W. E. Tomasetti.
Kairuku, Territory of Papua,
29 January, 1955.

Commonwealth Bank Grant For Native Co-operative Educational Centre

THE Commonwealth Bank of Australia has made a grant of £3,500 from its Rural Credits Development Fund to assist in establishing a Co-operative Educational Centre at Port Moresby. This centre will train natives in the methods, practices and business principles of Native Societies. A further grant of £3,500 may be made by the Bank next year, and the balance of the cost of the new Centre will be provided by the Native Co-operative Societies.

The Bank grant and the Educational Centre will be administered by four Trustees, namely:

G. MORRIS	Deputy Registrar of Native Societies
W. E. BRISKEY	Chief Inspector of Native Societies
MIRIA GAVERA ...	Secretary of the Central District Native Societies Association Ltd.
MAHURA RARUA	Secretary of I.E.S. Limited (a buying and importing agency for native co-operatives).

The Co-operatives Section of the District Services Department is already conducting courses for training natives in co-operative business management, but this work is handicapped by lack of suitable accommodation, both classrooms and living quarters. However, despite these difficulties 315 students passed the storemen's course last year, and of these sixty qualified for training as co-operative inspectors. The qualifications for entrance to the inspector's course is a pass of over 90% on the storemen's examinations. Storemen are trained to handle the routine management of a co-operative organization, including simple bookkeeping, and native co-operative inspectors must qualify for overall supervision of the societies, including audits as well as general management.

This year's Bank grant will be used to finance the purchase of land and erection of two dormitory buildings to accommodate twenty students each. Later two classrooms for thirty pupils each will be erected, also another dormitory, a mess hall and kitchen. The total cost of the completed Educational Centre will be approximately £11,500, and in addition to financing expenditure on construction and equipment above the Commonwealth Bank grants, the Native Societies will make annual grants from their own funds for the operation and maintenance of the school. Individual societies will assume responsibility for transport and living expenses for students, who will be nominated to attend the school by the various co-operative societies. This will ensure careful selection of students by the co-operative organizations, and village scrutiny of their progress while being maintained at the school.

Negotiations for the purchase of approximately one acre of native-owned land in Spring Garden Road, Port Moresby, for the school site are almost completed, and the erection of the buildings will be done under contract by a native building society. The buildings will be constructed of European materials on cement foundations, and fitted with glass louvre windows. Construction of the dormitories will start early in 1955.

General supervision of the school will be carried out by Mr. Briskey with a native instructor, Mr. John Taru, in charge of the classes, and both courses will be studied from a series of prepared instruction papers as in the present school.

The course for storemen can be completed in from six to eight weeks, and the training of inspectors takes from six to nine months depending on the educational standard of the student. Students who fail to make satisfactory progress are dropped from the classes as the course progresses. Last year, out of a total of 420 pupils, 315 completed the course for storemen, and thirty out of sixty successfully passed the inspector's course, which requires an 85% pass on the final examinations.

There will be no difficulty in obtaining suitable students for the new Centre, as there is already a waiting list. Candidates for the storemen's course must be literate and have a working knowledge of the English language and simple arithmetic. Trainees for the inspector's course must have completed their instruction as storemen, and have an educational standard equivalent to the last year of schooling at the Sogeri, Dregerhafen and Kerevat Higher Educational Centres.

The need for training more native co-operative staff is evidenced by the rapid expansion of co-operative activities. Starting in 1949-50 with a yearly turnover of £62,300 for all native co-operatives, this figure rose to £620,500 last year, and the estimate for the current year based on the half-yearly returns is around £800,000.

In the Central District, where native societies have been in operation for several years, these organizations are now conducting their activities entirely with their own paid staff, including the balancing of books and yearly audits.

Candidates for the inspector's course will be drawn from all parts of the territory, while student storemen will be trained at both Port Moresby and Rabaul, with the new school serving as the training centre for Papuan student storemen.

QUARTERLY READING LIST No. 14

A bibliography of publications relating to social development in the South Pacific.

THIS Reading List represents an attempt to note every item to appear in the field of Social Development in the South Pacific during the quarter; the entries are drawn from over 100 periodicals which are regularly examined, as well as from bibliographies, publishers' notices and similar material. Publications of the South Pacific Commission have not been indexed. Items marked with an asterisk have not been seen in the Social Development section. The Executive Officer for Social Development, G.P.O., Box 5254, Sydney, will be glad to obtain for any metropolitan or territorial Government copies of items listed.

SOUTH PACIFIC — GENERAL

General

(1) MANDER, L. A.: Some dependent peoples of the South Pacific. New York, Macmillan, 1954. pp. xix, 535. A study of anthropology, history and colonial administration, describing the nature of pre-European native society, the effects of European colonization and the present problems of government in the area.

Anthropology

(2) BELSHAW, C. S.: Anthropology in Oceania. *Eastern World,* vol. 8, no. 12, December, 1954. pp. 42-43.
(3) FIRTH, R.: Money, work and social change in Indo-Pacific economic systems. *International Social Science Bulletin,* vol. 6, no. 3, 1954. pp. 400-410.
(4) FREEDMAN, M.: Elkin's "Social anthropology in Melanesia" and Keesing's "Social anthropology in Polynesia": a review. *Man,* vol. 54, no. 121, May, 1954. pp. 82-83.
(5) LESSA, W.: Neueste amerikamsche ethnologische forschung in Ozeanien. *Zeitschrift fur Ethnologie,* no. 78. 1953.*

Co-operation and Co-operatives

(6) PACIFICUS (*pseud.*): A square deal for the Pacific islander. *Venture,* vol. 6, no. 7, November, 1954. pp. 8-10. A review article on the report by V. D. Stace on "The Pacific islander in modern commerce", prepared for the South Pacific Commission.

Geography

(7) CUMBERLAND, K. B.: Southwest Pacific: a geography of Australia, New Zealand and their Pacific Island neighbours. Auckland, Whitcombe and Tombs, 1954. xviii, 365 pp., illus., maps. Physical and human geography of the islands, the history of the islanders, the economics of the island territories and the prospects for future development.

History

(8) WHIPPLE, A. B.: Yankee whalers in the South Seas. New York, Doubleday, 1954. pp. 304.

Missions

(9) LEENHARDT, R.-H.: Koskinen's "Missionary influence as a political factor in the Pacific Islands". *Le Monde Non Chrétien,* N.S. No. 28, Octobre-Décembre, 1953. pp. 444-446.

MELANESIA

Anthropology

(10) KLARWILL, P. E.: Lommel's "Cargo Cult in Melanesia": a review. *Journal of the Polynesian Society,* vol. 63, no. 2, September, 1954. pp. 171-173.

MICRONESIA

Anthropology

(11) KLARWILL, P. E.: Stillfried's "Social Organization in Micronesia": a review. *Journal of the Polynesian Society,* vol. 63, no. 1, March, 1954. pp. 55-56.

POLYNESIA

Anthropology

(12) CARREYET, R. A.: Some physical characteristics of the Polynesians and their possible relationship to other racial types. *Journal of the Polynesian Society,* vol. 63, no. 1, March, 1954. pp. 69-74.
(13) L'element blond en Polynésie et les migrations nordiques en Océanie et en Amérique. Paris, Société des Océanistes, 1953. 48 p.*
(14) JOSSELIN de JONG, P. E.: The Kon Tiki theory of Pacific Migration. *Bijdragen Taal-, Land- en Volkenkunde,* no. 109, 1953*.

Description

(15) DERRICK, R. A.: The central islands of the South-west Pacific. *Etruscan,* vol. 4, no. 1, June, 1954. pp. 19-23, illus., map.

Linguistics

(16) ROSS, A. S.: Comparative philology and Polynesian studies. *Nature,* vol. 172, October 10, 1953. pp. 661-665. The same: reprinted in *Journal of the Polynesian Society,* vol. 63, no. 1, March, 1954. pp. 59-67.

BRITISH SOLOMON ISLANDS

Anthropology

(17) FIRTH, R.: Anuta and Tikopia: symbiotic elements in social organization. *Journal of the Polynesian Society,* vol. 63, no. 2, September, 1954. pp. 87-131, illus., map.
(18) OLIVER, D. L.: The relation between slit gongs and renown in a Solomon Islands culture. *Kroeber Anthropological Society Papers* (Berkeley), nos. 8-9, 1953. pp. 69-77.*
(19) WINTERBOTHAM, L. P.: A Tikopian talks. *Mankind,* vol. 5, no. 1, November, 1954. pp. 34-36. Notes of a discussion about Tikopia between the author and a Tikopian, Nori Koropana.

FIJI

Anthropology

(20) LEGGE, J. D.: Roth's "Fijian way of life": a review. *Historical Studies: Australia and New Zealand,* vol. 6, no. 23, November, 1954. p. 352.
(21) MAYER, A. C.: Interpersonal relations between Fiji Indian kin. *Man in India,* vol. 34, no. 1, Jan.-March, 1954. pp. 1-15.

Community Development

(22) CRAIG, J.: Hayden's "Moturiki": a pilot project in community development": a review. *Australian Quarterly,* vol. 26, no. 4, December, 1954. pp. 114-117.

FRENCH OCEANIA

Anthropology

(23) DANIELSSON, B.: Contributions to Marquesan anthropology. *Journal of the Polynesian Society,* vol. 63, no. 1, March, 1954. pp. 75-76, illus.
(24) DANIELSSON, B.: Raroian culture. *Atoll Research Bulletin,* no. 32, November, 1954. Washington, National Research Council. ii, 107 pp., bibl., maps. Contents include: economy, native topographical terms, bird names, native terminology of the coconut palm and check list of native names of fishes.
(25) DANIELSSON, B.: Raroia: happy island of the South Seas. Chicago, Rand McNally, 1953. pp. 304.*
(26) DANIELSSON, B.: Tuamotuan kinship terms. *Ethnos,* nos 3-4, 1953. pp. 155-166, bibl.
(27) MARSHALL, D. S.: An authentic Austral Islands *tiputa. Journal of the Polynesian Society,* vol. 63, no. 2, September, 1954. pp. 165-166, illus.

GILBERT AND ELLICE ISLANDS

Anthropology

(28) ROBERTS, R. G.: Mind over matter: magical performances in the Gilbert Islands. *Journal of the Polynesian Society,* vol. 63, no. 1, March, 1954. pp. 17-26, illus.
(29) TURBOTT, I. G.: *Portulacca,* a specialty in the diet of the Gilbertese in the Phoenix islands, Central Pacific. *Journal of the Polynesian Society,* vol. 63, no. 1, March, 1954. pp. 77-85.

Linguistics

(30) SABATIER, P.: Dictionnaire Gilbertin-Français. Tabuiroa, Gilbert Islands. Catholic Mission, 1954. xii, 984 pp. *Processed.*

GUAM

Archaeology

(31) REED, E. K.: Archaeology in Guam, 1952: a status report. *American Anthropologist,* vol. 56, no. 5, pt. 1, October, 1954. pp. 877-879.

NAURU

Development and Welfare

(32) A waning asset in Nauru, smallest Trust Territory. *United Nations Review,* vol. 1, no. 3, September, 1954. pp. 25-26, illus. Report of the Trusteeship Council discussion of the territorial annual report, including comments on the future welfare of the Nauruans.

NEW CALEDONIA

Description

(33) LEENHARDT, M.: Le Nouvelle-Calédonie. *Le Monde Non Chrétien,* N.S. 27, Juillet-Septembre, 1953, pp. 233-243.

History

(34) LEENHARDT, R-H. La première Mission en Nouvelle-Calédonie d'après le journal de Taunga. *Le Monde Non Chrétien,* N.S. No. 28, Octobre-Décembre, 1953. pp. 430-443.

NEW HEBRIDES

Anthropology

(35) NEVERMAN, H.: Polynesier auf den Neuen Hebriden. *Zeitschrift fur Ethnologie* no. 78, 1953. pp. 196-209.*

NETHERLANDS NEW GUINEA

General

(36) FEUILLETAU de BRUYN, W. K.: W. C. Klein's "Nieuw-Guinea": a review, *Tijdschrift "Nieuw-Guinea",* (i) vol. 15, no. 1, May, 1954. pp. 26-32; (ii) vol. 15, no. 2, July, 1954. pp. 56-63; (iii) vol. 15, no. 3, September, 1954. pp. 90-95.

Anthropology

(37) FEUILLETAU de BRUYN, W. K.: Goederenruil en handel bij de primitieve stammen van Nieuw-Guinea. *Tijdschrift "Nieuw-Guinea",* (i) vol. 14, no. 3, September, 1953. pp. 72-83; (ii) vol. 14, no. 6, March, 1954. pp. 168-175; (iii) vol. 15, no. 1, May, 1954. pp. 7-12; (iv) vol. 15, no. 2, July, 1954. pp. 39-45; (v) vol. 15, no. 3, September, 1954. pp. 72-74; (vi) vol. 15, no. 4, December, 1954. pp. 97-99.
(38) GALIS, K. W.: Het eram-feest te Bonggrang. *Bijdragen tot de Taal- land- en Volkenkunde,* vol. 110, no. 1, 1954. pp. 20-37, illus.*
(39) GALIS, K. W.: Nog een en ander oven de Humboldtbaaijtaal. *Tijdschrift "Nieuw-Guinea",* vol. 15, no. 4, December, 1954. pp. 100-104.
(40) HELD, G. J.: An archaic eastern society (New Guinea) in a modern eastern world. *Indonesia,* vol. 7, no. 6, October, 1954. pp. 471-480. Social Organization in New Guinea.
(41) LEEDEN, A. C. van der: Biografische Schets van Benjamin Mansi, imheems handelaar langs de kust van Sarmi. *Bijdragen Taal-Land- en Volkenkunde,* no. 110, 1954. pp. 217-239.*
(42) ZEG WAARD, G.: Vrouwenruil bij de Asmatters. *Tijdschrift "Nieuw-Guinea",* (1) vol. 15, no. 2, July, 1954. pp. 33-38 (ii) vol. 15, no. 3, September, 1954. pp. 65-71.

Archaeology

(43) GALIS, K. W.: Een stenen artefact van Nederlands Nieuw-Guinea. *Bijdragen Taal-, Land- en Volkenkunde,* no. 110, 1954, pp. 281-282.

(44) TICHELMAN, G. L.: Analogieen van het bronzen bijltje van Sentani. *Tijdschrift "Nieuw-Guinea"*, vol. 15, no. 4, December, 1954. pp. 105-111.
(45) TICHELMAN, G. L.: Rotstekening van een bronzen bijltje. *Tijdschrift "Nieuw-Guinea"*, vol. 15, no. 3, September, 1954. pp. 75-79, illus.

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(46) Australia: Commonwealth National Library. Select bibliographies: general series: no. 3: Indonesia: ix: the question of West New Guinea. Canberra, 1954. (ii), 21 p. *processed.*
(47) Bibliografie van Nieuw-Guinea. *Tijdschrift "Nieuw-Guinea"*, vol. 15, no. 3, September, 1954. pp. 89 and 96; vol. 15, no. 4, December, 1954. pp. 111 and 128.

Description
(48) WINKELMAN, A. M. Netherlands New Guinea. *Etruscan,* vol. 4, no. 4. September, 1954. pp. 2-5, illus., map.

PAPUA AND NEW GUINEA

Anthropology
(49) BERNDT, R. M.: Significance of prehistoric objects in the highlands of New Guinea. *Anthropos,* vol. 49, nos. 3-4, 1954. pp. 553-587, illus.
(50) GERSTNER, A.: Die glaubensmabige Einstellung der Wewak-Boikin-Leute zu den Krankheiten und deren Heilung (Nordost-Neuginea). *Anthropos,* vol. 49, nos. 3-4, 1954. pp. 460-480, illus.
(51) The role of women and women's organizations in the community (New Guinea). *African Women,* vol. 1, no. 1, December, 1954. pp. 19-25. Paper prepared by the Papuan delegation to the Second South Pacific Conference, April, 1953.
(52) WIRZ, P.: Quelques notes sur la Cérémonie du *"Moka"* chez les tribus de Mt. Hagen et du Wabaga sub district, Nouvelle-Guinée du Nord-Est. *Bulletin de la Société royale belge d'Anthropologie et de Préhistoire,* vol. 43, 1952, pp. 65-71.*

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(53) Bibliografie van Nieuw-Guinea. *Tijdschrift "Nieuw-Guinea"*, vol. 15, no. 3, September, 1954. pp. 89 and 96; vol. 15, no. 4, December, 1954. pp. 111 and 128.

Description
(54) SIMPSON, C.: Adam in plumes. Sydney, Angus & Robertson, 1954. xvii, 268 pp., illus., maps.

Government and Administration
(55) McAULEY, J.: Local government among the Tolai. *South Pacific,* vol. 7, no. 11, July-August, 1954. pp. 880-886.
(56) New Guinea—most backwards Trust area: stone age life still lingers in primitive regions only recently brought under administrative control. *United Nations Review,* vol. 1, no. 3, September, 1954, pp. 31-36, illus. Trusteeship Council discussion of the Annual Report.
(57) Overland patrol of the Tari-Strickland Gorge region. *South Pacific,* vol. 7, no. 2, September-October, 1954. pp. 909-915. Prepared by the Public Relations Office of Papua and New Guinea.
(58) SAAVE, J. J.: The Village Aid Posts: their organization and development in the Gazelle Peninsular of New Britain. *South Pacific,* vol. 7, no. 11, July-August, 1954. pp. 892-894, illus.

History
(59) BENSTED, J. T.: Captain Barton of Papua. *South Pacific,* vol. 7, no. 2, September-October, 1954. pp. 926-929 and 931. Reply to article by F. J. West on this subject in May-June, 1954, *South Pacific.*

Linguistics
(60) HALL, R. A.: The status of Melanesian pidgin. *South Pacific,* vol. 7, no. 2, September-October, 1954. pp. 916-920. Reprinted from *Australian Quarterly,* June, 1954.
(61) WURM, S.: Tonal languages in New Guinea and adjacent islands. *Anthropos,* vol. 49, nos. 3-4, 1954. pp. 697-702.

TRUST TERRITORY OF THE PACIFIC ISLANDS

Anthropology
(62) HUNT, E. E., KIDDER, N. R. *and* SCHNEIDER, D. M.: The depopulation of Yap. *Human Biology,* vol. 26, no. 1.*

Government and Administration
(63) Blending new with old in Pacific Trust Islands. *United Nations Review,* vol. 1, no. 4, October, 1954. pp. 47-54, illus. Review of recent developments in the Territory.
(64) MIDKIFF, F. E.: Problems of the Pacific Trust Territory. *U.S. Department of State Bulletin,* vol. 31, no. 787, 26th July, 1954. pp. 141-146. Statement by the High Commissioner of the U.S. Trust Territory.
(65) MIDKIFF, F. E.: U.S. Administration of the Trust Territory of the Pacific Islands. *U.S. Deuartment of State Bulletin,* vol. 31, no. 786, 19th July, 1954. pp. 96-109. Statement by the Territory's High Commissioner.

WESTERN SAMOA

Government and Administration
(66) A year of destiny in Western Samoa: paving the way for a self-governing state in the South Seas. *United Nations Review,* vol. 1, no. 3, September, 1954. pp. 27-30. Discussion of the territorial Annual Report by the U.N. Trusteeship Council.

Commission Visual Aids Programme

A SERIES of filmstrips, posters and flannelgraphs is now in production on such subjects as rhinoceros beetle, coconut cultivation, soil erosion and conservation, mosquito-borne diseases and general village health and hygiene. All material is being treated at village level and different approaches are being used, from black and white photographs to coloured cartoons.

Filmstrips which are now being distributed among island administrations and mission personnel for appraisal and comment include *Tofi and the Rhinoceros Beetle* (35 frames), a colour cartoon strip in the form of a simple story, with a Polynesian setting, and *Soap* (32 frames), also composed of coloured drawings, with a New Caledonian setting. Each strip is priced at A.30s. and is accompanied by text which may be used as it stands or on which users may base their own commentary. Also available are a flannelgraph on the use of soap (comprising 34 figures for colouring and cutting out, and accompanied by a suggested commentary, a colour guide and directions for use), two posters on soap (one a general poster, the other showing the uses of soap), and a poster on diet for pregnant and lactating women.

It should be stressed that all these visual aids are at present regarded as experimental only; any necessary amendments that may arise as a result of trial in the field will be incorporated in their final form.

Further information may be obtained from the Visual Aids Officer, Box 5254, G.P.O., Sydney, Australia.

Film and Filmstrip Catalogue

The new and expanded catalogue of films and filmstrips in the South Pacific Commission library is now available. The preparation has taken longer than was expected, as each item in the catalogue has been annotated in order to give as much information as possible about the films and filmstrip to territorial officers wishing to borrow them for appraisal purposes.

The catalogue is published as S.P.C. Technical Paper No. 71, at 3/- stg. per copy, and is available from the Commission's Editorial and Publications Officer, Box 5254, G.P.O., Sydney. Requests for loan of the films and filmstrips listed in it should be sent to the Visual Aids Officer at the same address.

How to Make Your Own Filmstrips

This little manual has been produced by the Social Development section of the South Pacific Commission for people in the Pacific Islands who are interested in making filmstrips for themselves. The contents include chapters on different kinds of filmstrips; stages of production, including preparatory work, the use of photographs or drawings, captions and sub-titles, and editing; and the writing of teaching notes or commentary.

Later chapters deal with Choice of Subjects, and South Pacific Commission Services available to people in the territories who wish to make their own filmstrips. A list of further reading is given at the end of the text.

The booklet, which is illustrated with photographs and line drawings, has been compiled by the Commission's Visual Aids Officer, who was formerly a member of the staff of Common Ground Ltd., London, one of the leading producers of filmstrips in the United Kingdom.

HOW TO MAKE YOUR OWN FILMSTRIPS. Nancy Phelan. Sydney: South Pacific Commission. 1954. pp. 33. Illust. 2/6d. stg.

Increase In Pacific Periodicals

(Continued from page 14)

a short story and a women's column, in addition to articles and other material of a more local interest. The first number appeared in January, 1955, the annual subscription being £stg.1/1/6, post free, or £stg.1/12/- by air mail, and it is obtainable from Administratie *Triton,* Seroeistraat, Hollandia.

Editors of local publications seeking assistance in the solution of technical problems, e.g., on printing or other reproduction processes suitable for use under island conditions; sources of news material, photographic blocks, etc.; and the procurement of printing supplies, are invited to write to the South Pacific Commission, Social Development section, Box 5254, G.P.O., Sydney, N.S.W., Australia.

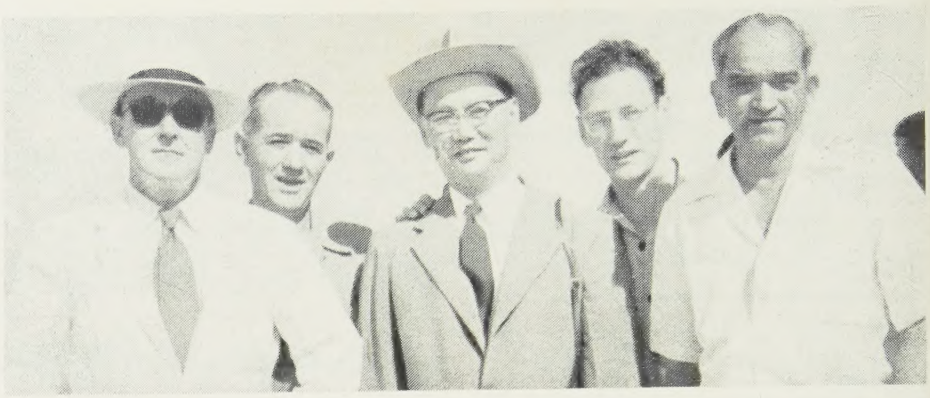
WHO Yaws Campaign Organizer Visits Commission Headquarters

FROM 4th - 8th February, Dr. D. R. Huggins, Adviser on Treponematoses and Venereal Diseases at the Regional Bureau of the World Health Organization at Manila, visited the headquarters of the South Pacific Commission. Last year, Dr. Huggins went to Fiji and Western Samoa to organize the campaign against yaws which was put into operation early this year.

On his present trip, Dr. Huggins visited the British Solomon Isands Protectorate and the New Hebrides to ascertain whether conditions there would be suitable for a yaws control campaign. He had talks in Nouméa with Dr. Augère, Head of the Health Department, on the campaign which is to begin in the Wallis Islands in July.

At the Pasteur Institute in Nouméa, he met Dr. Lacour, who has started serological investigations which are to include 2,500 islanders from amongst the various New Caledonian tribes.

At Commission headquarters, Dr. Huggins explored the possibility of Dr. Iyengar's participation at a conference on filariasis control, planned to take place in South-East Asia.



Dr. Huggins at Noumea with Commission officers. Left to right: Mr. J. Ryan (Acting Secretary-General), Dr. E. Massal (Executive Officer for Health), Dr. Huggins, Dr. G. Loison (Research Officer for Health), Dr. M. O. T. Iyengar (specialist in mosquito-borne diseases).

PRINCIPAL COMMISSION PUBLICATIONS

Publications issued by the South Pacific Commission include the following:—

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- *OFFICIAL RECORDS: Proceedings of Sessions of the South Pacific Commission* (First to Twelfth); *Annual Reports of the South Pacific Commission* (1948 to 1952); *Reports on the First and Second South Pacific Conferences; Progress Reports on Action Taken on the Resolutions of the First South Pacific Conference.*
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The Commission's Executive Officer for Social Development maintains a small stock of technical publications which will be sent on request to specialist officers working in Pacific territories. Requests should be addressed to the Executive Officers at Box 5254, G.P.O., Sydney.

The service regularly includes such periodicals as *Community Development Bulletin, Fundamental Education — A Quarterly Bulletin, South Pacific,* and *Pacific Islands Education.* Individual publications received recently and available under this service are:—

No. 162
Elementary Accounting Procedure for Credit Unions in Fiji. Suva, Credit Union Central Committee, 1954. 27 p.

No. 163
Elementary accounting procedure for credit unions in Fiji. Suva, Credit Union Central Committee, 1954. 27 p.

No. 164
Handbook of population census methods. New York, United Nations, Statistical Office, 1954. vii, 143 p.

No. 165
Syllabus for carpentry and joinery: a five-year course. Port Moresby, Dept. of Education, 1954. 10 p.

No. 166
Some observations on the problem of "self government" in the Trust Territory of the Pacific Islands by John Sandelman. Honolulu, 1953. 131 p.

No. 167
African Women. London, Department of Education in Tropical Areas, University of London Institute of Education. The first number of this new periodical was published as a supplement to the Colonial Review in December, 1954. It is to appear twice a year.

PICTURE CREDITS

Acknowledgment is made for photographs in this issue, as follows: Page 7, Netherlands Information Service; pages 10-12, 25-27, Fiji Official Photos; page 26, Australian Official Photo.

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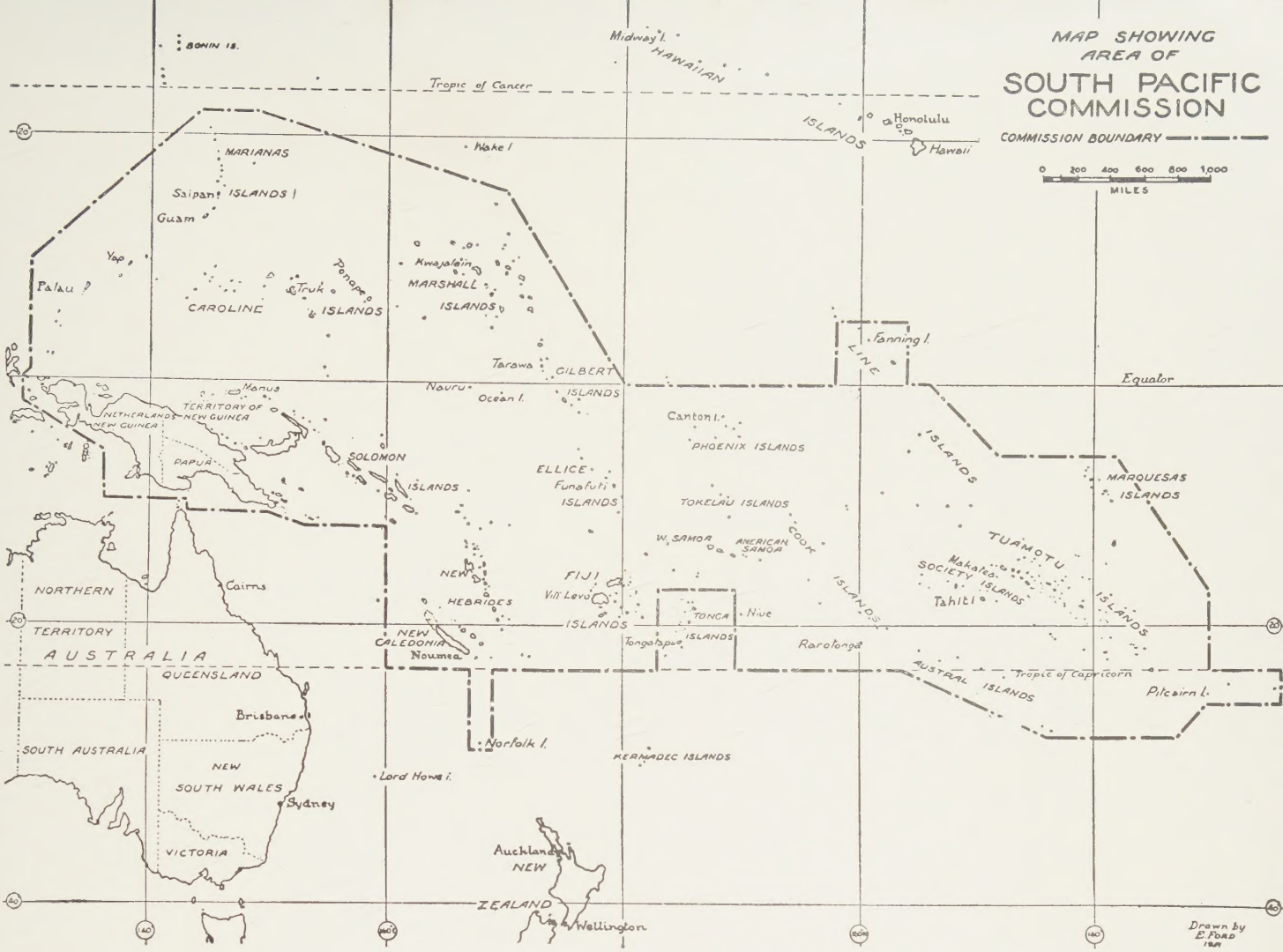

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75. **Catalogue of the Commission's Co-operative Library (Bibliography of Co-operation).** January, 1955. 155 pp.

76. **A Bibliography of Tropical Housing.** January, 1955. 42 pp.

77. **A List of Diseases and Parasites of Animals Recorded in the South Pacific Territories.** Bilingual. December, 1954. 60 pp.

78. **A List of Plant Diseases Recorded in South Pacific Territories.** Bilingual. December, 1954. 78 pp.

79. **A List of Insect Pests Recorded in South Pacific Territories.**

80. **Malaria Control and Research in Netherlands New Guinea.** By Dr. R. H. Black. In English, with a resume in French. March, 1955. 24 pp., map.

81. **Malaria in the South-west Pacific.** By Dr. R. H. Black. March, 1955. 60 pp., map.

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3. **The Village Library.** April, 1950. 9 pp., book list.
4. **Visual Aids in Education in the South Pacific.** By A. L. Moore, Visual Aids Consultant. April, 1950. 58 pp.
5. **Fisheries and Animal Health Research Projects of Significance for the South Pacific Region,** conducted under the authority of the C.S.I.R.O., Australia. May, 1950. 9 pp.
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9. **Report of Plant and Animal Quarantine Conference, Suva.** April, 1951. 24 pp., two annexures.
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42. **The Co-operative Movement in Papua and New Guinea.** Prepared by the Registry of Co-operative Societies, Port Moresby. February, 1953. 28 pp., sample Co-operative Society Records.
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